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ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW : XXII.*

(Edited by H. K. Airy Shaw).

Miscellaneous Records, 1949–51.

The comparatively few records made during the past three years relate principally to insects and fungi. As in the last two supplements, an asterisk (*) indicates introduced species ; square brackets enclose records from just outside the Gardens, and also page-references to earlier records of the species concerned in the original " Wild Flora and Fauna " [F.] and subsequent Supplements [I, II, etc.]. Thanks are due to Messrs. J. Balfour-Browne, R. B. Benson, J. D. Bradley and R. J. Izzard, of the British Museum (Natural History), for kindly determining several of the insects listed. Unsigned records and determinations are the compiler's (H.K.A.S.).

FAUNA

PROTOZOA

RHIZOPODA

Amoeba actinophora *Auerb.* Amongst green algae brought from new stream in centre of Rock Garden, 12.vi.51 (also earlier), *L. L. Forman.* —Apart from the *Rotifera* (F. 68–73], the Protozoa of the Gardens have so far been completely neglected.

INSECTA

HEMIPTERA–HETEROPTERA

Cydnidae

Sehirus bicolor *L.* Several nymphs in calyces of *Lamium album* by tennis courts, 11.vi.49. [XXI. 233].

Miridae

Rhopalotomus ater *L.* Herbarium Experimental Ground, 2.vi.49, *R. D. Meikle* ; several on grass by tennis courts, 11.vi.49, *H.K.A.S.*

Lygus cervinus *Herr.-Schaeff.* In Herbarium (probably brought in from Gardens on clothes), 13.vi.51.

* Continued from *Kew Bull.* **1949,** 238 (1949).

HEMIPTERA–HOMOPTERA

MEMBRACIDAE

***Amastris elevata** *Funkhouser*. On cocoa plant (*Theobroma cacao* L.) received from Jamaica, 14.vii.51, *L. Stenning*. (Det. R. J. Izzard, B.M.). Mr. Izzard writes : " Although recorded from cocoa plants in the West Indies, this is not considered a pest. It is not uncommon, but is by no means as common as many other Membracids."—The large tropical family *Membracidae*, characterized by the often fantastic appendages of the prothorax, are represented by only two native species in the British Isles.

LEPIDOPTERA

SATYRIDAE

Pararge aegeria *L.* The Speckled Wood. Behind Museum No. 1, 23.ix.49. [F. 36].

PIERIDAE

Colias croceus Fourcr. The Clouded Yellow. One flying and settled, by Jodrell Laboratory, 22.ix.49. [XVIII (" XVII "). 65].

SPHINGIDAE

Macroglossum stellatarum *L.* The Humming-bird Hawk-moth. One visiting flowers of *Ceratostigma plumbaginoides* Bunge outside Herbarium, 23.ix.49. [XX. 117 ; XXI. 234].

CARADRINIDAE

Mormo maura *L.* The Old Lady Moth. In car-shed by Herbarium. 2.vii.49. [III. 163].

ALUCITIDAE

Platyptilia calodactyla *Schiff.* On window of Herbarium, 31.viii.49.

TINAEIDAE

Ochsenheimeria mediopectinella *Haw.* One found in hand-basin in Herbarium, 29.vi.49, *B. Verdcourt*. (Det. J. D. Bradley, B.M.). This genus of dull brown, grass-feeding ' micros ' is characterized by the curious tuft of long scales in the middle of the antennae. The species are rather infrequently seen.

COLEOPTERA

NITIDULIDAE

Pocadius ferrugineus *F.* One crawling on window of Herbarium, 21.ii.50. (Det. J. Balfour-Browne, B.M.). Possibly emerged from *Lycoperdon* brought by H.K.A.S. from Kidney Wood, Luton, Beds., 19.ii.50.

CUCUJIDAE

Laemophloeus minutus *Oliv.* In Herbarium, flying readily, 6.ix.49, *R. B. Drummond*. (Det. J. Balfour-Browne, B.M.).

PHALACRIDAE

Olibrus corticalis *Panz.* One ovipositing in unopened heads of *Senecio squalidus* L. by tennis courts, 11.vi.49.

SCARABAEIDAE

[**Aphodius granarius** *L.* Flying over 'dog-walk', Kew Green, 14.iv.49, *R. A. Blakelock & H.K.A.S.*].

CERAMBYCIDAE

Grammoptera ruficornis *F.* Flying around shrubs near Director's orchard, 28.v.49.

CHRYSOMELIDAE.

Chrysolina oricalcia *Muell.* One on *Anthriscus sylvestris* by tennis courts, 11.vi.49. It is almost certain that this attractive species is associated with *Umbelliferae*, but its actual life-history appears to be unknown.

CURCULIONIDAE

Apion radiolus *Kirby.* On *Malva sylvestris* on allotments behind Herbarium, 7.vii.49, *B. Verdcourt.*

[**Sibinia primita** *Herbst.* One on windowsill of house, Bushwood Road, Kew, 3.xi.51. A very small but prettily marked weevil.]

PLATYPODIDAE

***Platypus hintzi** *Schaufuss.* Alive in mycological laboratory of Herbarium, 5.iv.50, *P. K. C. Austwick.* (Det. J. Balfour-Browne, B.M.). Doubtless emerged from fungi received from abroad.

HYMENOPTERA–SYMPHYTA

TENTHREDINIDAE

Athalia cordata *Lepel.* One female and several males on plant of *Ajuga chamaepitys* L. in Herbaceous Ground, 8.ix.49. (Det. R. B. Benson, B.M., from description). The female was apparently feeding on the pubescence of the leaves.

HYMENOPTERA–ACULEATA

VESPIDAE

Vespa crabro *L.* On ivy bloom, 30.viii.49, *J. Lange & R. D. Meikle.* A nest of this species in the large maidenhair tree (*Ginkyo biloba* L.) was unfortunately destroyed in 1950.

APIDAE

Andrena clarkella *Kirby.* [Flying low over grass, Kew Green, 13.iv.49, *B. Verdcourt* ;] 2 on path, Cambridge Cottage garden, 19.iv.49, *H.K.A.S.*

DIPTERA

SYRPHIDAE

Volucella zonaria *Poda.* Seen flying near Aroid House, 24.viii.49, *B. Verdcourt* ; one on ivy-bloom near Succulent House, 22.ix.49, *H.K.A.S.* [XXI. 236, which see.].

FLORA

Phanerogamia

ONAGRACEAE

Epilobium roseum *Schreb.* In flower bed by drive inside main gates, with *E. montanum* L., 29.vi.49. It is curious that this species has not previously been recorded from the Gardens.

Cryptogamia

FUNGI

R. W. G. Dennis.

BASIDIOMYCETALES (HOMOBASIDIEAE)

AGARICACEAE

***Mycena osmundicola** *Lange* ssp. **imleriana** *Kühner*. On fibre in pot of *Cattleya* sp., 9.v.50, *R. W. G. Dennis*. Probably specifically distinct from *M. osmundicola*. [Cf. XXI. 237.]

Psalliota cupreo-brunnea (*Schaeff. et Steer*) *Möller*. In the Gardens (exact locality not noted, but certainly at north end), 18.x.49, *H.K.A.S.* (Det. Möller, v.51, from water-colour drawing by Miss E. M. Wakefield).

Coprinus echinosporus *Buller*. On rotten twig lying on ground behind Herbarium, 26.xii.49, *J. Kennedy O'Byrne*. This species was described by Buller in *Trans. Brit. Mycol. Soc.* **6**, 363 (1920) from material collected in Queen's Cottage grounds from débris dredged from the lake. It would seem that the habitat is normally on small decaying twigs. The species differs from all other British *Coprini* in its rough spores.—E. M. WAKEFIELD.

LYCOPERDACEAE

Geastrum triplex *Junghuhn*. In some quantity on leaf-mould of ramie bed (*Boehmeria nivea* Gaudich.), in Nursery behind Palace, 17.x.49, *C. R. Metcalfe*.

FUNGI IMPERFECTI

***Phyllosticta masdevalliae** *P. Henn.* On *Masdevallia corniculata* Reichb. f., 1.ix.50, *V. S. Summerhayes*.

Botryosporium longibrachiatum (*Oudem.*) *R. Maire*. On *Selaginella* spp. in Ferneries, apparently killing them, 14.iii.50, *F. Ballard*.

National Trust Properties in Pictures.* These publications form two of a series of little booklets issued to illustrate properties held for the benefit of the nation by the National Trust. One of them gives an interesting introduction to the gardens at Bodnant, Denbighshire, situated on the east side of the Conway valley facing Snowdonia, the other to Stourhead in Wiltshire where is preserved a house of historic interest standing in a landscape garden which was developed with great success by 'Capability' Brown. Both are illustrated by excellent photographs depicting the buildings and the natural beauty of the surrounding scenery. These delightful little booklets will give pleasure to the many who appreciate beautiful houses and gardens.

H. S. MARSHALL.

*National Trust Properties in Pictures. [1]. The Gardens at Bodnant, Denbighshire. Pp. 4 + 20 photographs. [2]. Stourhead, Wiltshire. Pp. 4 + 24 photographs. London : Country Life Ltd. Price 2/6d. each.

NOTES ON CYPERACEAE: XXX*

E. Nelmes.

Submersed Species of Eleocharis with 1-flowered Spikelets.

In Dr. Henning Horn af Rantzien's paper in Botaniska Notiser, 1951, on certain aquatic plants collected by Dr. J. T. Baldwin in Liberia, there is an interesting descriptive account of the two submersed, 1-flowered species of *Eleocharis*, *E. naumanniana* Boeck. and *E. caillei* Hutch. Below are a few comments on and additions to his admirable paper.

He is right in my opinion to reject C. B. Clarke's view that this aquatic group is allied to the American *Scirpus submersus* Sauv. (*Webstera submersa* (Sauv.) Britton). This plant lacks the enlarged style-base which distinguishes *Eleocharis* from *Scirpus* and it differs further from the submersed *Eleocharis* species in possessing whorls of perigonial bristles. We have here, surely, a good example of parallel evolution.

Horn af Rantzien has not seen the type of *E. caillei* and is not clear about its specific distinctness from *E. naumanniana*, pointing out that the only difference mentioned in the Flora of West Tropical Africa is the septate stem of the latter species. One can add that *E. caillei* has more slender stems, and, as mentioned in my validating description of this species in the Kew Bulletin, 1951, 165–166, its smaller achene is constricted above into a short neck which re-expands into a discoid-annulate apex, on the centre of which persists the base of the style (see Svenson in Rhodora, 39 : 253–254, t. 461, fig. 6 (1937), as *E. naumanniana*). The achene of *E. naumanniana* tapers gradually to its apex, with no neck, the apex being completely hidden beneath the large and persistent style-base.

In these days the breaking up of genera seems very popular, and it is therefore refreshing to find Dr. Horn af Rantzien arguing thus : " As the achene is of the characteristic *Eleocharis* type, *E. naumanniana* and *E. caillei* have to remain within this genus though as a somewhat foreign element ", but he does add that they " merit a subgenus of their own ", which he provides in the name *Rheocharis* and a subgeneric description. To those who may be impatiently contemplating the creation of a separate genus for these submersed 1-flowered plants, one should introduce *E. subtilissima* Nelmes, an African aquatic with spikelets often reduced to two flowers, and the Brazilian *E. capillacea* Kunth, the very few-flowered spikelets of which usually ripen only one achene each, species which seem more or less to bridge the gap between the 1-flowered group and *Eleocharis* proper.

Specimens of a submersed *Eleocharis* received at Kew from collectors in Sierra Leone appear to belong to *E. naumanniana* but the stems are less distinctly septate. A curious thing about this plant is that some of the specimens, which came in spirit, had such a large, globose style-base that a distinct new species was apparent. After being out of the spirit for an hour or so, however, the style-base shrank to the more pyramidal one of (dried) *E. naumanniana*. One supposes that its shape and size may be more or less intermediate in life. Some other specimens sent from the same locality as a " dry land form " have normal roots and short, thicker,

Continued from K.B. 1952, 84.

non-septate stems, but their spikes match those of *E. naumanniana*, and they really do seem likely to be in fact a terrestrial form of this normally submersed, septate-stemmed species. These Sierra Leone specimens are cited immediately below.

Sierra Leone : Rokupr Agricultural Farm, in standing water, empoldered, once tidal, swamp, 26 Sept. 1947, *Jordan* 116 ; ibid., 11 Sept. 1947, *Jordan* 181 ; Newton, in masses floating in pond, 1 March 1948, *Jordan* 200 ; ibid., abundant in a pool (dammed stream), submerged with inflorescence protruding above the water, 3 Nov. 1951, *Deighton* 5627.—Terrestrial form :—Rokupr, growing on the edge of internal bunds on empoldered rice farm, densely tufted, 24 March 1947, *Jordan* 21, 22 ; ibid., 9 April 1948, *Jordan* 205.

Finally, one has to report the discovery, at a spot considerably distant from the area of the other two species, of a third member of this group of *Eleocharis*, received in the Department of Botany at the British Museum from M. Georges Le Testu. A description of this plant is given below. Its stems are rather less slender than those of its allies, and it differs distinctly in its obovoid achene with angles at the apex hidden beneath the strongly enlarged and decurrent style-base.

Eleocharis monantha *Nelmes*, sp. nov. ; ab *E. naumanniana* Boeck. culmis haud septatis, achaeniis obovoideis, basi styli in apicem achaenii arcte imposita angulis secus angulos achaenii decurrentibus distincta.

Planta submersa. *Culmi* numerosi, elongati, fiiliformes, haud septati, sulcato-compressi, flaccidi, proliferi. *Spiculae* sub anthesi lineares vel oblongo-lanceolatae, sub fructu lanceolatae, interdum proliferae, 4–5 mm. longae, 1-florae. *Glumae* 3, lanceolatae vel oblongo-lanceolatae, 4–5 mm. longae, membranaceae, infima pallida, superiores plus minus rubidae, marginibus involutae, dorso tenuiter carinatae. *Perigonium* nullum. *Stamina* 3. *Achaenium* 1, obovoideum, trigonum, angulis prominentibus, longitudinaliter valde cancellatum, stramineum, 1·2–1·4 mm. longum, 0·8–0·9 mm. latum. *Stylus* basin versus tenuis, basi ipsa valde pyramidalis, in apicem achaenii arcte impositus, angulis secus angulos achaenii decurrentibus.

French Equatorial Africa : Ubanghi-Shari-Chad ; 35 km. south-east of Bambari, near the village of Ngaodemba, marsh at the source of the river Grisi, pool in running water, floating, flowers expanded at the water level, 15 Nov. 1927, *Tisserant* 2353.

NOTES ON THE ANATOMY OF THE LEAF AND STEM OF ANISOPHYLLEA GUIANENSIS SANDWITH.

C. R. METCALFE.

Anisophyllea guianensis, a new species described by Mr. Sandwith in an article on p. 303 of this journal, is the first member of the genus to have been discovered in the New World. It was, therefore, felt that it would be both interesting and useful to examine the structure of the leaf and stem, and to compare it with that of a member of the same genus from the Old World. This comparison has shown that the stem structure of *A. guianensis* is very similar indeed to that of the West Tropical African species *A. laurina* R. Br. ex Sabine, and that there are, in fact, only a few minor differences between the two species. Furthermore, as was only to be expected, the anatomical structure of *A. guianensis* fits quite well into the wider picture of the anatomy of the *Rhizophoraceae* as summarized by Metcalfe and Chalk (2) in 'Anatomy of the Dicotyledons'. The chief anatomical characters noted in *A. guianensis* are recorded in the following description, which is based wholly on herbarium material.

LEAF.

Transverse sections through the dorsiventral lamina exhibit the upper **epidermis** composed of cubical cells filled with brown, amorphous contents ; the lower epidermis made up of smaller cells containing similar deposits to those in the cells of the upper epidermis ; a well defined **hypodermis** of colourless cells ; a narrow zone of **palisade tissue** consisting of 2–3 layers of rather short cells ; a much wider zone of **spongy mesophyll** ; the vascular bundles of the small **veins** embedded in the mesophyll and supported by thick-walled fibres which are, in turn, surrounded by a sheath of relatively thin-walled, pitted, parenchymatous cells with wide lumina ; the **midrib** with a shallow, crescent-shaped, vascular strand, strongly supported by a surrounding zone of thick-walled fibres which is especially well developed on the adaxial and abaxial sides of the vascular strand. **Petiole,** in transverse sections through the distal end, exhibiting an almost closed, crescent-shaped vascular strand, the interior of the crescent being filled with a tissue of highly sclerosed cells. The petiolar vascular strand is surrounded by a zone of thick-walled fibres, except on the abaxial side where the fibrous ring is interrupted and replaced by a few stone-cells. A slight break in the fibrous ring also occurs on the adaxial side of the vascular strand opposite the narrow entrance to the crescent of xylem and phloem. The 'cortical' region of the petiole is composed of collenchyma.

STEM.

The following description refers to a stem about 0·5 cm. in diameter.

Outer portion of the **bark** consisting of about 6 layers of cubical, thick-walled, cork cells, some of which are filled with brown, amorphous contents. Inner part of the bark exhibiting a broad zone of sclerenchyma composed mostly of very thick-walled, pitted stone-cells, small strands of narrow fibres with thick walls and minute lumina being situated amongst the stone-cells. A few of the stone-cells stand out from the remainder on account of the inner tangential and radial portions of their walls being strongly thickened whilst the outer tangential walls remain thin. Crushed

remains of parenchymatous cells also present in the inner part of the bark. **Phloem** rather disorganized in the available material ; traversed by the triangular distal ends of the rays which are partly composed of very thick-walled stone-cells. **Xylem.** Vessels of the secondary xylem very unevenly distributed ; sparse in, or almost completely absent from, certain sectors, but much more numerous in the remainder of the xylem. Some vessels solitary, but mostly arranged in irregular clusters and multiples of four or more. Vessels small, radial diameter about 32–88μ in the limited material examined. Pits in the lateral walls somewhat variable in size and arrangement, frequently opposite, the individual pits being circular to horizontally elongated or even almost scalariform. Perforations simple, somewhat oblique. **Parenchyma** most abundant where the vessels are most numerous ; some paratracheal parenchyma associated with all of the vessels, locally tending to be aliform. Metatracheal, banded parenchyma also present, especially where the vessels are less congested, the bands being 1–3 cells wide. **Fibres** with very thick walls and narrow lumina constitute most of the ground-tissue of the wood ; pits numerous, especially in the radial walls, some of them inconspicuously bordered. **Rays** very conspicuous, 1–4 or 5 cells wide and quite outstandingly tall, some as much as 230 cells high noted in the limited material available ; individual ray cells square or upright, each of a few of them almost completely filled with a large solitary crystal. **Pith** mostly composed of relatively thin-walled, abundantly pitted, parenchymatous cells. Solitary and small clusters of conspicuous, very thick-walled, pitted stone-cells occur amongst the parenchymatous cells of the pith.

Discussion.

The stem structure of *Anisophyllea guianensis* is very similar to that of the African species *A. laurina* R. Br. ex Sabine as represented by the herbarium specimens *Deighton* 4731 and 1863, from Sierra Leone.

In this last species the pith is more heterogeneous owing to the presence in it of axial columns of cells filled with chemical deposits. Cluster crystals are also present in some of the pith cells. In *A. laurina* the lateral pitting of the vessels tends to be less definitely opposite, and more nearly alternate, than in *A. guianensis*. *A. laurina* also differs from *A. guianensis* in having no stone-cells in the pith. The leaf structure of the 2 species was not compared owing to the lack of suitable material The small differences between the stems of the two species are of very much the type that is commonly to be found in different members of a single genus.

The leaf structure of *A. guianensis* resembles that of other genera of *Rhizophoraceae* in having a well developed hypoderm below the adaxial epidermis. Mucilaginous epidermal cells are also common in the family, and it seems probable that the amorphous deposits noted in the epidermal cells of the herbarium material of *Anisophyllea* may represent disorganized mucilaginous material. The vascular structure of the petiole in different genera of Rhizophoraceae exhibits a considerable range of structure, but crescent-shaped vascular strands, similar to those of *Anisophyllea*, are known to occur in some members of the family.

In comparing the structure of the secondary xylem of *A. guianensis* with that of other members of the family, it should be remembered that

most of the statements in the literature refer to the wood of timber samples rather than to the secondary xylem in young twigs. Furthermore the wood structure is far from uniform throughout all members of the *Rhizophoraceae*. Indeed, Marco (1) divided the family into 4 groups on the basis of wood structure, an arrangement that has since been confirmed and extended by Chalk (2). The wood structure of *A. guianensis*, like that of other species of *Anisophyllea* that have been previously investigated, falls into Marco and Chalk's group II which comprises the genera *Anisophyllea*, *Carallia*, *Combretocarpus*, *Crossostylis* and *Gynotroches*. Two characteristics of members of this group are the broad, exceptionally tall rays and the almost complete absence of scalariform perforation plates. *A. guianensis* resembles other members of the group so far as these 2 characteristics are concerned, and in all other important respects as well. It should, however, be noted that the lateral pitting of the vessels in most members of group II, including other species of *Anisophyllea*, tends to be alternate, as opposed to the opposite pitting in *A. guianensis*. It is significant in this connection that the intervascular pitting in the wood of genera belonging to group I (*Bruguiera*, *Ceriops*, *Kandelia* and *Rhizophora*) is scalariform, so that the opposite pitting (with a tendency to be scalariform) which occurs in young twigs of *A. guianensis* is intermediate between that of groups I and II. It is, however, desirable for the trunk wood of *A. guianensis* to be examined, for it is just possible that the opposite pitting is especially characteristic of the wood of young twigs. The evidence already available clearly shows, however, that the structure of *A. guianensis* strongly resembles that of other members of the genus.

References.

(1) Marco, H. F. Systematic Anatomy of the Woods of the Rhizophoraceae. Trop. Woods, No. **44**: 1–20 ; 1935.

(2) Metcalfe, C. R. and Chalk, L., Anatomy of the Dicotyledons. 2 vols. Oxford 1950. See pp. 601–12.

Material Examined.

1. *Anisophyllea guianensis* Sandwith. Forestry Department British Guiana No. 4246.

2. *Anisophyllea laurina* R. Br. ex Sabine. Deighton 4731 and 1863, Sierra Leone.

Microscope slides of the above mentioned material from the Kew Herbarium have been added to the slide collection at the Jodrell Laboratory.

Botanizing as it should be.* The phenotypic characters of a botanist, like those of any other organism, are presumably the combined result of heredity and environment. Samuel Butler, George Bernard Shaw, and Buddhists may acclaim the responsibility of the individual even for what the orthodox scientist regards as genetic chances pre-ordaining his hereditary make-up. Possibly the botanist has some degree of choice with regard to his environment. Anyhow, to what sort of wife he is attached is of great importance to his work. This is, perhaps, more true of the taxonomist than of any other subspecies of botanist. Most often the taxonomist is a collector. He must, therefore, get out into the " field ", whether this be marsh and bog, forest, or mountain range. His specimens have to be dried ; labels have to be written ; bundles have to be packed and stored or carted about. Naturally, specimens, especially if grasses, are of greater importance than ordinary matters of food, clothes, and household furniture. They must never be touched except by the taxonomist himself. The household, at a safe distance, must revolve around the collecting and the collections. Yes, a wife is an important item in the environment of a botanist.

Mrs. Bor adds to the essential activities and behaviour of a botanist's wife by recording her experiences of living and travelling in northern India over a period of years when her husband, Dr. N. L. Bor, was successively Forest Officer, Forest Botanist, and administrator of the Burma Refugee Organization. Her book makes most interesting reading. Presumably it would be classified by librarians as a " travel " but the appropriate title defines its contents clearly. Mrs. Bor has a style, and a syntax, of her own and the result is an original, exhilarating, and sometimes amusing series of chapters mainly concerned with tours in and across the Himalaya and residence for longer or shorter periods at such centres as Kyelang, Dehra Dun, and Shillong.

Though Mrs. Bor states she is not a botanist, and cannot raise any very great enthusiasm even for grasses, there are many references to plant life in her book. The making of paper from the bark of *Daphne* (p. 66) ; the destruction of forests and its consequences (pp. 70 etc.) ; the description of forests under monsoon conditions (pp. 75–6) ; the description of *Rafflesia* or " sapria " (pp. 93 seq.) and its photograph (opposite p. 129) ; the cultivation of " khut " or *Saussurea lappa* (p. 149) ; and the edibility of rhododendron blossoms (p. 148) and of the leaves of *Eremurus* (p. 129) are among the items of direct botanical interest. It is, however, the general outline of the life of a botanist's household, including dogs and cooks and sanitary arrangements, that gives the book its peculiar value, even to those herbarium taxonomists who depend on the energy of collectors, and their wives, to provide their working materials in the form of dried specimens or of plants introduced into cultivation.

There is no index but a special word of commendation must be said about the illustrations. These are plates of photographs or of original drawings by the author. Not only do they illustrate the book but they also supplement the text. Some of them are exceptionally beautiful. One is particularly glad to have that opposite p. 195. The frontispiece so combines Scottish and Irish humour as to be appreciated even by an Englishman.

W. B. TURRILL

*Eleanor Bor : Adventures of a Botanist's Wife, pp. 204, plates of photographs and drawings, 26th June 1952, Hurst & Blackett Ltd., 18/- net.

RUSSULACEAE OF TRINIDAD AND VENEZUELA.

ROLF SINGER,

Instituto Miguel Lillo, Tucuman, Argentina.

Russula puiggarii *Speg.* & *Sing.*, Lilloa **12,** 793 (1951).

Clitocybe puiggarii Speg. in Bol. Acad. Nac. Cienc. Cordoba **9,** 389 (1889).

Russula brasiliensis Sing. in Pap. Michigan Acad. Sci. Arts & Lett. **32,** 108 (1948).

Spegazzini, who thought it to be a *Clitocybe*, and Singer (op. cit. 1948) have already published descriptions of this species based on dried material. Opportunity is taken here to redescribe this very distinctive species from Dennis' notes and drawings of fresh material :

Pileus fuscous between " Aloma " and " toast ", Maerz & Paul), with the cuticle cracking along the striae, plicate-sulcate-striate, glabrous, margin acute, convex with applanate centre, 29 mm. broad. Lamellae white to very pale cream, rather broad (3·5 mm. broad), close, equal, with venose anastomoses, adnexed to almost adnate ; spore print (thin) pure white. Stipe white, tapering upwards, solid, glabrous or almost so, 33 × 3 at apex, 4·5 mm. at base. Context white ; taste mild, odour none.

Microscopically there is complete agreement between the Brazilian collections (Puiggari and Rick) and Dennis' Trinidad material. The latter has spores which are globose or subglobose and therefore subortho-tropic, coarsely reticulated (I) when young, later some of the connecting lines become thinner (type II), 10·2–11 μ in diameter : basidia mostly ventricose above, few truly clavate, 40–72 × 7–16·5 μ tetrasporous, very few bisporous ; macrocystidia with granular or somewhat amorphously banded contents, versiform, most frequently ventricose and about as large as the basidia. The epicutis of the pileus consists of hairlike ascendant to erect bodies, many of their terminal members transformed into oleiferous elements with banded contents, these elements are very narrow and often acute. The subcutis underneath the epicutis consists of slightly gelatinized hyaline hyphae forming a " cutis " in the sense of Lohwag ; below it is the fuscous hypodermium, likewise forming a cutis and consisting of subparallel repent hyphae. All these layers are rather thin and at places rudimentary in the specimen studied because of infection with an Actinomyces.

Collections seen : Trinidad : Under bamboos, River Estate, Diego Martin 27.x.1949, *Dennis* 243, Upper Caura Valley on sandy soil beside the trail, 13.xi.1949, *Dennis* 243B. This species belongs to the section Pellicullariae Heim, subsection Discopodinae, and is the only known South American representative of this African group.

Russula venezueliana *Sing.*, spec. nov.

Pileo fusco dein brunneo, subviscido, glabro, margine acuto, longe striato-pectinato, subgloboso subdepressoque, dein repando et demum concavo, 42 mm. lato. Lamellis albis dein lacteis, mediocriter latis (4·5 mm.), confertis, adnexis ; sporis in cumulo haud visis. Stipite fuscidulo-griseolo (" walnut taffy ") dein griseo-pallido, glabro, haud

viscido, haud radicante, cavitatibus internis praedito, obscuris fibrilloso (?)-venuloso evelato, aequali vel apice subcontracto, basi obtuso-rotundato, 34–51 × 8·5–10 mm. Carne alba, in siccis ad griseum fuscumve tendente ; sapore mitis, odore nullo vel subnitrico fractu. Sporis 9·5–9·7 × 8–8·3μ, manifeste asymmetricis, heterotropicis, echinatis ornamentatione typi (II) IIIa (IIIb), 1–1·4μ (plerumque 1–1·1μ) projiciente, hyalinis ; basidiis 43–51 × 11–13·8μ, clavatis, latis, tetrasporis, perpaucis bisporis ; cystidiis contentu fibrilloso destitutis, plerumque granulis sparsis minutis in parte superiore impletis, haud gloeocystidioideis, incrustatione inconspicua saepe obsitis, hyalinis, ventricosis vel ventricoso-ampullaceis, apice attenuatis sed obtusis vel subobtusis, profunde radicantibus, tenuiusculo-tunicatis, voluminosis; epicute pilei ex elementis fasciculatis laxe dispositis, hyalinis, piliformibus erectis vel ascendentibus, haud incrustatis, multiseptatis acutis vel obtusis consistente ; subcute gelatinosa, ex hyphis intertextis sed laxe dispositis hyalinis filamentosis efformata ; hypodermio sub subcute ex elementis densioribus cutem formantibus, pigmentatis consistente ; pigmento fusco, dissoluto, intracellulari ; superficie stipitis membris termina libus hypharum sparsis ascendentibus, tenuiter filamentosus, acutis vel obtusis hyalinis ornata ; hyphis omnibus haud amyloideis, defibulatis. In silva sat sicca ad terram.

Venezuela : Rio Chacaito, Caracas, *Dennis* 408, 18.xi.1949 (Typus).

This species is undoubtedly new, characterized by the brownish grey pileus and stipe, mild taste, large warts connected by thin lines forming a complete (rarely partial) reticulation and a few thick ridges on some spores, the pectinate margin and the light coloured lamellae. Since there is no spore print and no chemical characters are available the determination of the section to which it belongs must await further collections to supply these essential data. The aspect of the species is that of *Russula sororia* with some characters of *R. puiggarii*.

Russula dennisii Sing., ad int.

Pileus yellow with a slight ochre brown cast, glabrous, with smooth acute margin, vaguely sulcate in dried condition, with indistinct scattered veins, convex or applanate with depressed centre, 62–64 mm. broad. Lamellae cream with a white bloom of spores, distant, thick, didymous, rather broad or medium broad (4·5–7 mm.), adnexed to decurrent, spore print not obtained. Stipe ochraceous fulvous, glabrous, more or less longitudinally wrinkled in dried material, glabrous and dry, solid, cylindric-ventricose to obconical, tapering strongly from the apex to the base which, however, is not acuminate, 17–23 × 14–15 mm., annulus none, basal mycelium whitish, sparse. Context white, without latex, consistently mild to the taste, odour none when fresh. Spores 9–10·3 6·2–7μ, heterotropic, ornamentation projecting 0·4–0·6μ, i.e. rather low, of type II, IIa, with fine but distinct connecting lines, some of the lines in many spores thick, forming a network ; basidia 62–68 × 11–11·7μ 1, 2, 3 or 4-spored ; cystidia 70–100 × 7–8·5μ, numerous on edge and sides of gill, deep-rooting, acute or obtuse, cylindric-subfusoid, with oily-granular, amorphous contents but not gloeocystidia (not deep blue in cresyl blue mounts) ; hymenophoral trama with numerous spherocysts although many connective hyphae are intermixed, laticiferous (?) and

oleiferous hyphae also numerous ; epicutis of the pileus very little differentiated, only the outermost layer slightly modified so that the conducting elements take the form of thin dermatopseudocystidia and the connective hyphae that of hair-like elements (ciliate dermatocystidia) while the spherocysts are represented by vesiculose saccate bodies. All these elements together form an irregular palisade, quite fragmentary in places. Hypodermium not well differentiated. The non-lacticiferous and oleiferous elements tend to be thick-walled. All hyphae are nonamyloid without clamp connections.

Collection seen, TRINIDAD : on bare soil in the lower montane forest at c. 2000 ft. beside the trail as it leaves Naranja for Tucuche, 27.xi.1949, *Dennis* 383.

Dennis' figure reminds one of *Lactarius hygrophoroides* and I hesitate to describe this species as a new *Russula* though it was collected as a *Russula* by Dennis. However, the numerous spherocysts in the gill trama, the complete absence of latex in the fresh carpophores, in contrast to *L. hygrophoroides* which almost always shows abundant latex like all other species of the same section, Dulces Heim, suggest that Dennis 383 is one of the primitive species still close to both *Russula* and *Lactarius* and having somewhat the aspect of a *Hygrophorus*, the section now called Archaeinae Heim (*R. earlei*, *R. fragilissima*, *R. archaea*, *R. hoehnelii*). If so it differs from all the other Archaeinae in its spore ornamentation, perhaps also in being less fragile and in the entire, smooth or subsmooth surface of the pileus.

Russula metachromatica Sing. spec. nov.

Pileo albo, subviscido, glabro, margine acuto, breviter dense sulcato-striato, ceterum levi, convexo-applanato, centro leniter depresso, 53 mm. lato. Lamellis albis, paucis brevioribus intermixtis sed haut heterophyllis, confertis vel confertissimis, angustis (2·5 mm. latis), anguste adnexis ; sporis in cumulo haud visis. Stipite albo, cylindraceo, cavitatibus instructis, subtiliter ruguloso, subreticulato 50 × 10 mm., annulo nullo. Carne alba, odor nullo, sapore miti sed post nonnullos secundos subacri. Sporis (9)–11–12·3 × (8)–10–11 μ, heterotropicis, hyalinis, ornamentatione (1)–1·2–1·4 μ alta cristulata vel recticulato-catenulata typi II, IIIa-VIII rarius IIIb-VIII, IIIb-II), the ridges if present being short or long and sometimes appearing to consist of very crowded warts running in a straight line, or not, with some fine reticulating lines always present and forming a complete or incomplete network ; basidia 35–51 × 11·5–15 μ, plerumque clavatis, rare clavato-ventricosis apice attenuato, tetrasporis perpaucis bisporis ; macrocystidiis 48–96 × 9·5–15·5 μ, contentu granuloso-fibrilloso abundante impleto haud gloeocystidioideis, crasse tunicatis (membrana 1–1·5 μ crassa), ventricoso-fusoideis, ventricoso-subampullaceis, ventricoso-subcylindraceis, rarius subclavatis, apice plerumque attentuatis sed rotundatis, appindiculo destitutis, interdum centro constrictis, numerosissimis praesertim ad aciem sed etiam ad latera lamellarum, metachromaticis ; tramate hymenophorali cellulari sed multis hyphis connectivis intermixtis ; epicute pilei hyphosa, laxe disposita, paucis elementis piliformibus (dermatocystidiis ciliatis) vel dermatocystidioideis (pluribus ad marginem pilei), membris terminalibus hypharum oleiferum interdum cystidioides 4–4·5 μ latis

cylindraceis, intus granuloso-fibrillosis, membrana tenuiore quam in macrocystidiis hymenii instructis, perpaucis dermatomacrocystidiis veris visis eis hymenii simillimis ; hyphis defibulatis. Ad terram in silva humidissima.

Venezuela : Mt. Periquito, Rancho Grande, Maracay, c. 4000 ft., 19.xi.1949, *Dennis* 407, Typus.

This species is characterised by its complete absence of pigment and by its metachromatic macrocystidia when studied in cresyl blue mounts. Whereas in other species the cystidia are then either weakly metachromatic, or non-metachromatic in *Russula metachromatica* the macrocystidia stand out because of their strongly pinkish-red thick walls while the basidia stain blue. I cannot allot this species to its exact nitch in the classification because the chemical characters and the exact colour of the spore print are unknown but it may be close to certain species of subsection Plorantes Bat. (*R. delica* etc.). However, the habit as suggested by Dennis' figures is not that of a member of the Plorantes but rather of the Ingratae.

Russula aosma *Sing.*, spec. nov.

Pileo sordide cremeo griseo in zona marginali (" India buff "), fusco-brunneo in centro (" cinnamon brown "), glabro, sed subflocculoso in centro post siccatem, margine subacuto et in zona 5 mm. lata striato-sulcato, cuticula separabili obtecta (in zona marginali aut in centro ?), dein applanato centro depresso, c. 50 mm. lato. Lamellis albis, subconfertis, subangustis vel mediocriter latis (3·5–4·5 mm. latis), attenuato-attingentibus, paucis lamellulis irregulariter intermixtis, sporis in cumulo haud visis. Stipite pallidiore pileo sed haud albo, glabro, farcto, cylindraceo, 49×9 mm., velo nullo. Carne alba, tenui, odore nullo, sapore tarde acerrimo. Sporis 9–11 × 8·3–9·5μ heterotropis, ornamentatione 1–1·5μ alta, reticulata vel subreticulata (typi IIIa, frequentius IIIb, raro IV), hyalinis, ambitu verrucoso-aculeolatis ; basidiis 41–51 × 11·5–13·7μ, ventricosis, tetrasporis ; macrocystidiis haud metachromaticis, haud gloeocystidioideis, 41–70 × 6–8·5μ, admodum subtiliter granulato-fibrillosulis intus, moderate numerosis ad aciem atque ad latera lamellarum, appendiculo praeditis vel destitutis, cylindraceo-subventricosis ; epicute pilei stratum subpallisadicum constituente ex hyphis erectis vel semierectus, saepe multiseptatis et ciliatis, apice acutis vel rotundatis, saepe e cellula basali tumida ortis, hyalinis, haud gelatinascentibus, haud incrustatis consistente ; subcute ex hyphis fortiter gelatinosis, admodum intertextis, irregulariter laxeque dispositis, hyalinis consistente hyphis oleiferis intermixtis quae saepe formant membra terminalia dermato pseudocystidioidea ubi stratum epicuticulare penetrant (dermato-pseudocystidiis subcylindraceo-subventricosis, apice rotundatis intus granuloso-fibrillosis, e gr. 38·5 × 7μ) ; hypodermio ex elementis filamentosis hyalinis cutem formantibus dense intertextis, pigmento intracellulari dissoluto brunneolo-fusco impletis efformato ; sphaerocystibus ubique numerosis etiam in tramate hymenophorali et sub hypodermio numerosis cum hyphis connectivis inamyloideis, defibulatis. Ad terram uliginosam in silva.

Trinidad : Siparia, 3.xi.1949, *Dennis* 281 (Typus).

This species is evidently new but of uncertain position. It may belong

in section Ingratae but has no odour whatever, at least according to Dennis' notes. It differs from *R. venezueliana* Sing., which is evidently the closest species, in having strongly acrid taste, shorter sulcate not pectinate, margin and on the average less completely reticulate spores. As might be expected from the acrid taste, the epicutis has some dermatopseudocystidia penetrating it as terminal members of the oleiferous hyphae of the subcutis.

Lactarius neotropicus *Sing.*, spec. nov.

Pileo ferrugineo-fulvo ("spice") subunicolori sed in locis subexcoriatis (Leucoagarici excoriati modo) zonae marginalis pallidiore, minute vellereo, in squamulas rupto in zona marginali, sed ceterum levi cuticulaque integra, convexo, centro fortiter depresso, nec striato nec sulcato, 34–41 mm. lato. Lamellis pileo pallidioribus, confertis, ad marginem pilei acutissimis, regulatim intermixtis, angustis (usque ad 2 mm. latis), adnexo-subliberis vel leniter descendente-subdecurrente ; sporis in cumulo candidis. Stipite lamellis concoloribus, vellereo, praesertim in parte inferio, solido, basin versus attenuato, haud radicato, 13–16 × 7–8 mm., annulo apicali (1 mm. a linea insertionis lamellarum distante), demum obsoleto et minus apicali, anguste distante, fibrilloso-membranaceo, margine crenato ornato, stipitis superficiei concolori. Carne concolori stipitis superficiei sed nonnihil obscuriuscolorata in parte interiore stipitis, immutabili ; latice aquoso-albescente, sparse fluente ; odore nullo ; sapore acerrimo. Sporis 7·5–10·2–(11·7) × 6·2–9μ, forma variabilibus (e. gr. 8·2 × 7·5μ i.e. subglobosis, 8·5–7·2μ i.e. breviter ellipsoideis, 11·7 × 8·9μ i.e. ellipsoideis), heterotropis, appendice hilari oblique inserto, guttula olei centrali globosa instructis, hyalinis, apparenter sublevibus in KOH-phloxina, sed ornamentatione fortiter amyloidea, usque ad 0·7μ projiciente, typi IIIa, rarissime IIIb gaudentibus ; basidiis 28–51 × 7–9·5μ clavatis, tetrasporis, perpaucis bisporis ; gloeocystidiis 27–70 × 5·5–9·7μ versiformibus, saepe appendiculatis, plerumque cylindraceo-subventricosis, contentu cresylophili sparso vel frequentius denso impletis ; vasculis gloeiferis nullis sed vasculis oleiferis haud cresylophilis filamentosis crassiusculis (7–11μ diam.) longissimis, numerosis, rarissime stratum hymeniale perforantibus et tunc pseudocystidia laticifera formantibus his et vasculis contentu granuloso-fibrilloso gaudentinus, membrana metachromatica haud gaudentibus ; ad aciem lamellarum elementis similibus sed brevioribus observatis ; Tramate hymenophorali sphaerocystibus sat numerosis intermixto ; epicuta pilei ex elementis piliformibus, crinea generis Crinipellis in mentem revocantibus, trichodermium efformatibus, crasse tunicatis (membrana 1·3–3·5μ crassa), e parte ventricosa mediana vel inferiore apicem versus attenuatis, apice rotundatis vel subobtusis, hyalinis vel stramineo-hyalinis, levibus, inamyloideis, 35–170 × 4–11μ, rarissime furcatis, sed pluribus simplicibus ; hyphis hypodermii cutem efformantibus, filamentosis ; hyphis omnibus defibulatis. Ad terram in silva secundaria.

Trinidad : on path between Maqueripe trail and North Post, 30.ix. 1949, *Dennis* 97 (Typus).

This is a remarkable species, closest to *L. zenkeri* (Henn.) Sing. and *L. pandani* Heim from West Africa and Madagascar respectively, in section Lactariopsidei Sing. (Lactariopsis Heim). It differs from the latter species in not being lignicolous, in the colour and covering of the mature

specimens, in the more strongly reticulate ornamentation of the spores, perhaps also in some characters of the cystidia which are typical gloeocystidia, turning deep rich blue in cresyl blue mounts but not being metachromatic as far as the walls are concerned. The primordia have not been seen and it is thus not known whether they are veined or smooth. Certainly both pileus and stipe seem to have a more velvety appearance in *L. neotropicus* than in *L. pandani*. Our species differs from *L. zenkeri* in the absence of a distinctive odour, in the spore ornamentation being more consistently completely reticulate and taller and in the colour of the adult carpophores which is nowhere orange-brown. It may differ also in some of the cystidial characters and the hairs of the epicutis on the pileus seem to differ from those of *L. zenkeri* in never being distinctly bistratose though they show an indistinct covering layer on the outside and another on the inside towards the lumen.

Lactarius panuoides *Sing.*, spec. nov.

Pileo isabellino vel cinnamomeo-pallido, subtomentoso in juvenilibus, praesertim prope marginem, sed in vetustis plerumque ubique irregulariter scrobiculato-venoso, opaco, glabrescente, levi in juvenilibus, laterali in juvenilibus et in adultis vetustisque, cicumferentia subreniformi, usque ad 35 mm. lato. Lamellis rubello-griseolis (" Caen stone", " vanilla "), alutaceis et albopulverulentis in adultis, pallidioribus in juvenilibus, sed tund latice plerumque maculatis, lamellulis regulariter intermixtis, nonnullis interdum furcatis, mediocriter latis subconfertis vel subdistantibus, decurrentibus ; sporis in cumulo separato haud visis sed certe albis vel palidissime cremeis. Stipite albido, tomentoso-strigoso in parte inferiore, pro ratione brevi et in parte posteriore in superficiem pilei inmarginate transiente, laterali, 2–12 × 1·5–3 mm. ; velo nullo ; mycelio basali tomentoso albo. Carne alba vel albida, in parte inferiore stipitis tenaci, molliore ceterum, latice albo, in speciminibus junioribus ad cinnamomeum vergente sicando nec non in maculis lamellarum ; odore nullo ; sapore miti. Sporis 7·5–9 × 6·2–7·5μ, brevissime ellipsoideis vel sat breviter ellipsoideis, heterotropis, ornamentatione altitudine variabili (0·6–1·4μ), typi II, II IIIa, IIIb, plerumque cristulata (II), minus frequenter reticulatis (IIIa , raro incomplete reticulatis (IIIb) ; basidiis 30–45 × 7–10·3μ, clavatis, mox collabentibus et tunc basidiolis in elementa cystidioloidea transformatis quae basidiis homologa sunt, fertilibus tetra- vel bi-sporis ; lacto-cystidiis (pseudocystidiis e prolongatione laticiferarum in hymenium natis) plus minusve 8·3μ latis, rotundatis ad apicem, haud appendiculatis, moderate numerosis, contentu amorpho haud cresylophilo impletis ; tramate hymenophorali intermixto, sed sphaerocystibus destituto, laticiferis numerosis voluminosis intermixto (laticiferis usque ad 18·5μ latis), hyphis cylindraceis nonnullis subinflatis sed 7–11μ diam. haud superantibus ; subhymenio in juvenilibus ex hyphis elongatis tenuibus, catenulatis consistente, dein nonnulis elementis latioribus sed vix isodiametricia catenulatis in parte inferiore subhymenii praesentibus ; epicute pilei ex elementis erectis flavis crasse tunicatis piliformibus ex strati hypodermialis elementis tumidis natis (elementis his clavato-vesiculatis vel vesiculato-fusoideis vel subglobosis, frequenter verticaliter catenulatis hyaline, 9·5–17μ latis); hyphis omnibus inamyloideis, defibulatis.

Ad basin trunci vivi Bactridis (palma) et in truncis emortuis de silvis

montanis inferioribus usque ad litus maris, dense gregario vel imbricate verne.

Trinidad : Quinam, *Dennis* 109A, 4.xi.1949 ; Naranja, 2.x.1949, *Dennis* 109 (Typus).

The yellow laticiferous vessels do not turn deep blue in cresyl blue mounts and the walls are not metachromatic. The hypodermal layer is pale blue, the epicuticular layer violet in cresyl blue.

Lactarius panuoides Sing. is a very interesting member of the genus. It is quite isolated among the primitive Lactarii of the tropics and represents a distinctive element of the western tropics not paralleled by anything yet known from Africa or Asia. The subcellular layer underneath the hairy epicutis reminds one somewhat of *L. russula* Rick, but the other characters, including the thick-walled surface hairs, the felty base, etc., remind one of the Lactariopsidei. Its lateral habit, mild taste of the white watery latex and the scrobiculate-venose surface of the old caps are characters strictly its own. It should be placed in a section of its own. Panuoidei Sing. sect. nov. Epicute pilei ex pilis crasse tunicatis flavis composita : hypodermio ex hyphis inflatis saepe catenulatis composito ; sporis heterotropis, cristatis vel reticulatis ; superficie pilei adulti scrobiculato-venosa ; stipite laterali : latice albescente-aquoso, gloeocystidiis absentibus ; sapore miti : lignicolae. Typus ; *Lactarius panuoides* Sing."

SOME FUNGI ERRONEOUSLY ASSIGNED BY PERSOON TO THE DISCOMYCETES.

R. W. G. Dennis.

The writer has recently had occasion to examine the material surviving in the Persoon herbarium of fungi which he or his successors have referred to *Helotium*. These ancient collections are now carefully preserved at Leiden and sufficient remains to show that a number of names which still recur in Discomycete literature are in fact based on Basidiomycetes or Fungi Imperfecti.

Helotium aureum Pers., Syn. Fung., 678 (1801).

Peziza aurea Pers. Fr. Syst. Myc. **2,** 156 (1822).

Of this there remain three authentic collections :—

(1) Herb. Lugd. Bat. 910, 256–1303 labelled " Ex Misnia, Ludwig ". This is the holotype but unfortunately consists only of a small fragment of wood bearing stem bases of two fructifications. These, however, match the corresponding parts of the complete fructifications remaining on the other two collections.

(2) Herb. Lugd. Bat. 910, 261–975, labelled " Helotium aureum cum Hysterio mytilino et Sphaeria quadam " and, in another hand, evidently that of the collector, " Ce champignon croit sur écorce morte et le bois mort denudé d'écorce du sapin. On voit aussi sur le bois un Hysterium mélangé à la Leotia, Mars."

(3) Herb. Lugd. Bat. 910, 256 –1302, labelled by Persoon " Helotium aureum Syn. fung. Ex Helvetia " and in another hand " Helotium aureum Avril. Peut être trouverez-vous celui ci, qui croissoit sur l'écorce et non

dans les Cavernules (?) comme mon No. 229 et celui de la Fl. Nisk. plus conforme à vos échantillons 1820=81 "

The two latter collections bear numerous well-developed fructifications of a bright yellow stilbaceous fungus evidently identical with *Dendrostilbella baeomycioides* (Massal.) Lindau. In the discussion appended to the label of Herb, Vindob. Krypt. Exs. 1838, issued as *D. baeomycioides* and received at Kew in 1911, Keissler has already recorded a guess that this might be the case but his hint seems to have been largely ignored. *Helotium aureum* (Pers. ex Fr.) Fr. still figures as a Discomycete, not only in the older compilations of Phillips (1887), Rehm (1893), Massee (1895) and Boudier (1907) but also in the more modern flora by Migula (1913) and in the latest list of British Discomycetes (Ramsbottom & Balfour-Browne 1951). Persoon's epithet is probably the oldest validly published for this Stilbaceous fungus, which occurs on coniferous bark, especially on resinous exudations. British collections seen under the name *Helotium aureum* belong to species of *Helotium* or allied genera, the true fungus of Persoon's herbarium has apparently still to be found here.

Peziza buccina Pers., Syn. Fung., 659 (1801) ; Fries, Syst. Myc., 2, 129 (1822).

Helotium buccinum (Pers. ex Fr.) Fr., Summa Veg. Scand. 355 (1849).

The collection labelled " Peziza Buccina P." in Persoon's hand, Herb. Lugd. Bat. 910, 261–287 is in excellent condition, with an attached water-colour sketch of the fresh fungus. It is clearly the species fully described by the Tulasnes under the name *Guepinia Peziza* and better known today as *Guepiniopsis torta* (Fr.) Pat. Phillips (1887) had already guessed as much for he wrote of British material filed under the name, " It is, to me, a *Guepinia*, there being no asci present." Nevertheless Rehm (1893), Boudier (1907) and Migula (1913) still compiled it as an *Helotium*.

Leotia fimetaria Pers., Obs. Myc. 2, 21 (1799).

Helotium fimetarium (Pers.) Pers., Syn. Fung. 678 (1801) ; Fries, Summa Veg. Scand. 355 (1849).

Peziza fimetaria (Pers.) Fr., Syst. Myc. **2,** 157 (1822).

Stilbum fimetarium (Pers. ex Fr.) Berk. et Br. Ann. Mag. Nat. Hist. Ser. 2, **5,** 465 (1850).

The holotype was " in fimeto vaccino " and was apparently not preserved. Herb. Lugd. Bat. 910, 258–374, labelled by Persoon "Leotia fimetaria " bears five flattened rabbit droppings which carry a stilbaceous fungus with hyaline conidia 3–4 × 2–2·25μ. Though now bleached white throughout this is no doubt identical with *Stilbum erythrocephalum* Ditm. ex Fr. Berkeley and Broome's interpretation of the species, thus confirmed, seems to have been generally accepted and the name *Helotium fimetarium* has long dropped out of Discomycete literature.

Peziza perula Pers., Mycol. Europ. **1,** 280 (1821) ; Fries, Syst. Myc. **2,** 125 (1822).

Phialea perula (Pers. ex Fr.) Gillet, Discom. France 105.

Herb. Lugd. Bat. 910, 261–375, labelled " Peziza Perula " by Persoon carries a very thin flattened fructification, now almost black throughout, in which no trace of asci was found. It is almost certainly a *Cyphella*.

Dr. Mass Geesteranus, who we have to thank for so very kindly sending the above material on loan to Kew, informs us that authentic collections of *Peziza faginea* Pers. *P. flavo-virens* Pers., *P. nigripes* Pers., *P. conigena* Pers. and *P. serotina* Pers can no longer be traced in the Persoon herbarium.

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : LV.*

DISCOVERY OF *ANISOPHYLLEA* IN AMERICA

N. Y. Sandwith.

Perhaps the most remarkable of Mr. D. B. Fanshawe's recent discoveries in the forests of British Guiana is that of an undoubted species of the peculiar genus *Anisophyllea*, which has hitherto been known only from the Old World, where it is widely distributed in tropical Africa, Madagascar and tropical Asia. As recorded by H. F. Marco (1) in 1935, only three other genera of *Rhizophoraceae*, *Cassipourea*, *Rhizophora* and *Sterigmapetalum*, have previously been known from the American continent. Of these, the first two are well known in many parts of the Old World tropics, while *Sterigmapetalum* is a curious monotypic genus endemic in the Brazilian Amazon region. *Anisophyllea* itself has been separated by Ridley (2) as an "Order" equivalent to a family, *Anisophylleae*, and by Burkill (3) and Corner (4) as a distinct family, the *Anisophylleaceae*, but it is normally treated in *Rhizophoraceae* as the leading member of the subfamily *Anisophylleoideae* or the tribe *Anisophylleae*.

Mr. Fanshawe has made four separate collections of the Guiana species, all in the same area of forest near the Potaro River, at 107–108 miles along the Bartica Potaro Road. He writes that its known distribution is between the Mazaruni and Essequibo Rivers, from the Kaburi River south to the Pakaraima escarpment. The species is an unbuttressed tree of small to middle size, growing in Kakaralli† (*Eschweilera*)–Clump Wallaba (*Dicymbe*) forest on lateritic ironstone soil. The Kew material of one of the gatherings has good and apparently hermaphrodite flowers, but a second, with male inflorescences, provided only a single flower for dissection. The third collection bore only very immature buds, while the fruits of the fourth unfortunately rotted before they could be sent to Kew. Even so, it would be a pity not to draw up at least a provisional description from the available material of this outstanding discovery.

The Guiana tree is one of the species with uniformly large glabrous leaves and, like some others, appears to lack those very minute alternating leaves which gave the genus its name ; but this absence can be proved only by field observations and the collection of seedlings. Occasionally, near the base or the apex of branchlets, the large leaves have themselves been extremely reduced to a similar size. The inflorescences are conspicuously supra-axillary, in the sense that their bases are adnate to the branchlets for several millimetres. This character, which is evident in other species, e.g., *A. cinnamomoides* (Gardn. et Champ.) Alston, *A. apetala* Scortech. ex King, *A. scortechinii* King, *A. griffithii* Oliv., *A. dichostyla* Engl. et von Brehm., has been ignored by most authors, but was noted for three species by Sir George King (5), in his "Materials for a Flora of the Malayan Peninsula," and is given by M. Lemée (6) in his "Dictionnaire" of the genera of phanerogams. On a Belgian Congo collection of *A. dichostyla* (*J. Louis* 64), the individual flowers of upper, short, reduced axillary inflorescences are adpressed to the branchlet. In the Guiana species this phenomenon is extended to the free axis of the inflorescence

*Continued from K.B., 1952, p. 260.

†See also Imperial Forestry Institute Paper No. 29, pp. 57, 93, fig. 13 (1952).

itself ; each bract is isolated from the " sessile " flower above it and a strong line of pubescence, similar to that of the flower itself but unlike the glabrescent axis, connects the two organs. The explanation would seem to be that a pubescent pedicel, adnate to the axis, connects the bract with the flower. A similar relation of bract to flower can be observed in *A. laurina* R. Br. ex Sabine (see *Deighton* 1863 and 4731, from Sierra Leone) and *A. fallax* Scott Elliot, of Madagascar ; while a phase intermediate between the relation of petiole to inflorescence and that of bract to flower is well illustrated in the apparently unbranched inflorescence of *A. apetala* Scortech. ex King (see *Scortechini* 684), in which short and strongly pubescent lateral branches with sessile female and pedicelled male flowers are adnate to the glabrescent main axis.

Baillon's (7) failure to mention this aspect of the morphology of *Anisophyllea* in his account of the genus may perhaps be put down to lack of material. Corner (4) both emphasises and illustrates the presence of supernumerary axillary buds, e.g. in *A. grandis* Bth. and *A. griffithii* Oliv. The relation of the phenomenon of superposed serial buds to that of apparent supra-axillary inflorescences and adnate secondary axes along inflorescences of *Anisophyllea* is of obvious importance for understanding the morphology of this genus, and it is to be hoped that a thorough anatomical investigation of living or pickled material will soon settle this question.

Another interesting and important character of Mr. Fanshawe's species is the division of each narrowly linear, pubescent petal, about half way, into only three long, filiform, laciniae. *A. scortechinii* King, of Malaya, has the petals 3-fid at the apex, but very shortly so, since the petals (including their divisions) are shorter than the sepals. The petals of *A. sororia* Pierre, of Gaboon, are described as " sericeis ", but as only 3·5 mm. long, and bilobed with 3 laciniae between the lobes. Most of the other species appear to have glabrous or papillose petals with a broader basal part and more numerous divisions.

A further point to be settled by future observations and collections is whether the Guiana species is monoecious or dioecious, and whether the flowers are always polygamous or unisexual. Schimper (8), in Engler and Prantl's Pflanzenfamilien, described the flowers of *Anisophyllea* as polygamous-monoecious, Baillon (7) emphasised their polygamous character, while Bentham and Hooker (9) evidently treated them as hermaphrodite. Both King (5) and Corner (4) describe the flowers of Malayan species as unisexual, while Hutchinson (10) described those of tropical African species as hermaphrodite. In a recent paper on the species of the southern Congo, P. Duvigneaud and J. Dewit (11) state that numerous specimens examined by them appeared to be polygamous-andromonoecious, with both male and hermaphrodite flowers, and they add : " toutefois, il peut s'agir dans certains cas d'une protandrie très accusée." The flowers of the Guiana species which are here described as hermaphrodite rather than female bore stamens with dehiscing anthers as large as those of the male flowers from another collection.

The affinity of the Guiana species is difficult to assess, since the West Tropical African species are often represented by incomplete or sterile material, and are imperfectly worked out. The best known species of West Tropical Africa, *A. laurina* R. Br. ex Sabine, is distinguished at once

by the more numerous divisions of the petals, which are broad, obovate or elliptic, and glabrous in the lower part, and by the longer stamens. The indumentum, where present, of the Guiana species is similar to that of *A. laurina* ; that is to say, the hairs are minute and more or less straight, and do not fall into either of the two categories by which Duvigneaud and Dewit (11) distinguish species of the southern Congo, a very different phytogeographic region, where the species of *Anisophyllea* are bushes in open forest or sub-shrubs in steppe, often with a strong indumentum. The leaves and indumentum of the Guiana tree resemble those of *A. cinnamomoides* (Gardn. et Champ.) Alston (*A. zeylanica* Bth.), of Ceylon, at least as much as those of any African specimens. Since this Guiana material neither matches any from the Old World nor agrees with descriptions of Old World species, it is regarded as representing a very distinct new species, as follows :

Anisophyllea guianensis *Sandwith*, sp. nov. ; Americae australis incola, foliis homomorphis glabris basi conspicue obliquis inaequilateris, inflorescentiis supra-axillaribus, praesertim petalis satis longis anguste linearibus inferne pubescentibus prope medium in lacinias 3 tantum longas divisis, staminibus brevibus notabilis ; *A. laurina* R. Br. ex Sabine, quae foliis nonnunquam sat similibus gaudet, forma glabritieque petalorum staminibus longioribus statim distinguitur.

Arbor parva vel mediocris, ramulis teretibus glabris vel minute pubescentibus laevibus et plerumque haud lenticellatis ; internodia 2–5 cm. longa. *Folia* alterna, homomorpha (parva alternantia desunt), ovata, ovato-oblonga vel lanceolato-oblonga, apice conspicue acute acuminata, basi conspicue obliqua inaequilatera cuneata vel rotundata, 8–17 cm. longa, 2·8–7 cm. lata, coriacea, glabra, utrinque nitidula, siccitate flavo-olivacea vel olivacea vel brunneo-plumbea, more generis basi oblique 5–7-plinervia, costa nervisque primariis supra canaliculato-impressis subtus valde prominentibus, nervis secundariis subhorizontalibus subparallelis velut venulis supra impressis vel planis subtus prominulis ; petiolus glaber, brevis, 2–4 mm. longus. *Inflorescentiae* axillares et terminales, axillares ramulo per 5–8 mm. semper insigniter adnatae tum patulae vel patentes ; masculae inferne ramosae, graciles, flexuosae, ad 15 cm. longae, ramis multo brevioribus, sparse pubescentes vel glabrescentes ; superfemineae similes sed axillares saltem ut videtur omnino simplices, demum robustiores ; bracteae anguste deltoideo-lanceolatae vel fere ovatae, acutae, glabrescentes vel plus minusve ciliatae, plerumque 0·5–1·5 mm. rarius ad 3 mm. longae. *Flores* ut videtur sessiles sed revera pedicellos breves dense pubescentes super bracteis axi inflorescentiae adnatos ita terminantes ut cicatrix floris delapsi paulo sed plerumque conspicue super bractea distinguatur. *Floris masculi* sepala 4 ovata acuta, 1·3–1·5 mm. longa, 1–1·2 mm. lata, pubescentia ; petala 4, laciniis inclusis 4·5 mm. longa, inferne 0·3 mm. lata praecipue secus margines pubescenti-pilosa, infra medium in lacinias 3 flexuosas fragilissimas divisa ; stamina glabra, circiter 0·5 mm. longa, 4 libera, 4 epipetala paulo supra basin petalorum inserta, antheris 0·2 mm. longis 0·3 mm. latis ; discus sinuato-lobatus ; styli dense pubescentes. *Floris hermaphroditi vel saltem superfeminei* calycis tubus ovoideo-ellipsoideus, supra ovarium constrictus, 2–3 mm. longus, 1·5–2 mm. latus, pilis papillisque

flavicantibus demum deciduis subsericeo-pubescens ; sepala 4 ovata, acuta vel acuminata, 1·5–2 mm. longa, 1·3–1·5 mm. lata, carnosa, utrinque pubescentia ; petala 4 alba, 5–6 mm. longa, inferne anguste linearia circiter 0·3 mm. lata papilloso-pubescentia, prope medium in lacinias 3 filiformes flexuosas fragilissimas inferne saltem papillosas ad 3 mm. longas divisa ; stamina glabra, 0·5–0·75 mm. longa, 4 libera, 4 epipetala paulo supra basin petalorum inserta ; discus valde sinuato-lobatus ; styli 3–4, triangulari-subulati, circiter 0·5–0·75 mm. longi, basi tantum plus minusve cohaerentes, inferne pubescentes dilatati, apicem versus levissime recurvi ; ovula 3–4. *Fructus* teste lectore oblique ovoideus, pericarpio tenui.

British Guiana. Potaro River : Mahdia River, 107–108 miles Bartica–Potaro Road, in " Kakaralli " (*Eschweilera*)—" Clump Wallaba " (*Dicymbe*) forest on lateritic ironstone soil, *D. B. Fanshawe* in *Forest Department* nos. 3760 (Jan. 1943, ♀ fls., white petals, type in Kew Herb. , 3912 (Jan. 1943, ♂ fls.), 4246 (Nov. 1943, buds), 5487 (Aug. 1947, ♀ fls., fr.). The fruit of the last collection became unfit for preservation. It was described by Mr. Fanshawe as " oblique ovoid, mealy green, soft shelled."

The trees are noted as unbuttressed. The type (no. 3760) was 67 ft. high and 8 in. diam., no. 3912 was 30 ft. high and 6 in. diam., no. 4246 40 ft. high and 6 in. diam., while no. 5487 was " a shoot " 15 ft. high and 2 in. diam. in secondary forest.

Dr. E. M. Chenery (12, 13) has cited species of *Anisophyllea* as typical examples of aluminium-accumulators with leaves which dry yellowish-green, and he tells me that the contents of species of this genus have a range of from 1·0 to 2·0 per cent Al., or 10,000–20,000 parts per million, of their oven-dried leaves. In June, 1950, he tested material of one of the collections, viz. *Forest Dept.* no. 5487, of *A. guianensis*, and found the aluminium content as 1·12 per cent. Al., or 11,200 parts per million, of the oven-dried leaf.

The anatomy of the stem and leaf of *A. guianensis* is described by Dr. C. R. Metcalfe in a separate paper beginning on page 291.

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GRAMINEAE AUSTRALIENSES : IV.*

Spartochloa, a new genus of Australian Grasses.

C. E. Hubbard.

In the past the structure of the grass-flower has been omitted from most specific and from many generic descriptions, being considered of little or no value for purposes of classification. It has been noticed, however, that these more intimate parts of the grass plant, although very small, often provide clues to unexpected relationships where strong superficial resemblances have led to plants from different tribes being treated as members of the same genus. An example of such a grass is to be seen in *Brizopyrum scirpoideum* Steud. (Syn. Pl. Glum. 1 : 282, 1854). This Western Australian species was transferred to *Schedonorus* by Bentham (Fl. Austral. 7 : 655, 1878), but it is usually treated as a *Festuca*, to which genus it was referred by F. v. Mueller (Fragm. Phyt. Austral. 8 : 129, 1873). Those who have had occasion to study it closely, however, must have been doubtful about its generic position, since its strongly xeromorphic, solid and basally-noded culms, coupled with the extreme reduction of its leaf-blades, provide a combination of characters not found in any other species included in the genus *Festuca*. An examination of its flowers has drawn attention to two features in which it differs markedly from true species of *Festuca* ; they are the fleshy truncate cuneate lodicules and the deep purple coloration of the stigmas. In typical species of *Festuca*, the lodicules are two-lobed or two-toothed, fleshy at the base and thinner in the upper part, whilst in the numerous species dissected by me, the stigmas have always been whitish or pale cream. These differences are associated with distinctions in the texture of the lemmas, for while those of *Festuca* are herbaceous, especially in the median portion, those of Steudel's *Brizopyrum* are thinly coriaceous except for the scarious margins. Finally another small but highly significant difference was noticed in the ligule being reduced to a ciliolate rim, contrasting with the membranous ligule of *Festuca*. On account of these seemingly trivial, yet to me important distinctions, I am convinced that the external similarity between the spikelets of *Brizopyrum scirpoideum* and those of some species of *Festuca* is not to be regarded as evidence of affinity, but rather of parallel development, a phenomenon which has often been the cause of incorrect classification in the *Gramineae*.

When living material of this grass becomes available for study, it should be examined cytologically, since in other grasses possessing the same kind of lodicules, purple stigmas, thinly coriaceous-scarious lemmas and cioliolate ligules, the chromosomes have been found to be of the smaller type in multiples of five, six or nine, whereas those of *Festuca* are of the large kind in multiples of seven. Having decided that the grass under discussion must be removed, not only from the genera *Festuca*, *Brizopyrum* and *Schedonorus*, but also from the tribe *Festuceae*, a search for possible allies was made among the genera with ciliate ligules. The only species with this type of ligule which show slight evidence of relationship are included in *Triodia* R. Br., a polymorphic genus confined to Australia. From these, it may be separated by its peculiar habit, the extremely small

*Continued from K.B. 1941, 25.

blades of the culm-leaves, the thinner entire or minutely emarginate lemmas, and the evenly spaced nerves of the latter. It is so distinct from *Triodia*, however, that a new genus, to be named *Spartochloa*, is proposed here for its reception.

Spartochloa *C. E. Hubbard* ; genus novum, a *Triodia* R. Br. culmis viridibus basi squamis brevibus elaminatis dense obtectis, laminis foliorum brevissimis vel nullis, lemmatibus integris vel minute emarginatis tenuioribus, nervis lemmatum aequaliter distantibus differt.

Spiculae ovatae vel oblongae, subteretes, demum a latere leviter compressae, muticae, in paniculis angustis pedicellatae ; rhachilla supra glumas et inter anthoecia demum horizontaliter disarticulans, internodiis crassiusculis apice minute pilosis. *Anthoecia* 3–6, ♀, vel summo plus minusve redacto ; callus brevissimus, truncatus, minute pilosus vel glaber. *Glumae* persistentes, spicula multo breviores, subaequales, explanatae oblongae vel anguste ovatae, obtusae vel acutae, dorso convexae, chartaceo-scariosae, laeves ; inferior 1–3-nervis ; superior 3-nervis. *Lemmata* imbricata, dorsa convexa, explanata ovata vel late ovata, apice minute emarginata et e sinu minute mucronata, vel integra et plus minusve obtusa, marginibus scariosis exceptis tenuiter coriacea, glabra, 5–9-nervia, nervis superne in medium vergentibus. *Paleae* lemmatibus subaequilongae, anguste oblongae vel ellipticae, obtusissimae vel truncatae, bicarinatae, inter carinas concavae et scariosae, carinis laevibus vel scaberulis vel rigide ciliolatis. *Lodiculae* duae, cuneatae, truncatae, carnosae, glabrae. *Stamina* tria ; antherae lineari-oblongae. *Ovarium* glabrum ; styli liberi, terminales ; stigmata plumosa, atropurpurea, ex anthoeciis lateraliter exserta. *Caryopsis* ignota.

Gramen perenne caespitosum ; culmi junciformes, teretes, rigidi, solidi, simplices, virides, persistentes, basi excepta enodes ; folia basalia, exteriora brevia, lata, elaminata, basim culmorum dense obtegentia, interiora elongata, arcte appressa, teretia, laminis linearibus vel subulatis 1–3 mm. longis praeditis ; ligulae ad seriem ciliorum brevium redactae ; paniculae elongatae, lineares, ramis brevibus erectis 5–1-spiculatis.

Species unica, Australiae occidentalis incola.

Spartochloa scirpoidea (*Steud.*) *C. E. Hubbard*, comb. nov.

Brizopyrum scirpoideum Steud. Syn. Pl. Glum. 1 : 282 (1854). " Drummond Coll. IV. Nr. 102. N. Holl."

Festuca scirpoidea (Steud.) F. Muell. Fragm. Phyt. Austral. 8 : 129 (1873) ; Vickery in Contrib. N. S. Wales Nat. Herb. 1 : 8 (1939).

Schedonorus scirpoideus (Steud.) Benth. Fl. Austral. 7 : 655 (1878).

Western Australia : Melbourne ; Wongan Hills, 7-10-1903, *Morrison* K.275! Avon ; Merredin, 10-10-1923, *Koch* 2838 ! East of Bruce Rock, granite outcrops, 10-1932, *Bailey* K.276! Camp 93, 10-12-1891, *Helms* (*Elder Exploring Expedition*) ! Without precise locality, *Drummond* 102! 156! 213!

NOTES ON ASIATIC GRASSES : VIII

The genus Eremochloa Büse in India and Burma.

N. L. Bor.

Büse, in Miquel, *Plantae Junghuhnianae* 1, 357 (1854), proposed the genus *Eremochloa* for a grass which he had found in Junghuhn's herbarium. This specimen had been collected by Ludwig Horner, a Swiss geologist and surgeon, on the island of Sumatra " in graminosis vastis " and was named by Büse *E. horneri* Büse, in honour of its discoverer. In the same place Büse speculates upon the identity of *Nardus ciliaris* Linn. published by Linnaeus in *Species Plantarum* ed. 1, 1, 53 (1753) and wonders whether it might not be another species of his new genus. Had he been able to see this specimen he could not have failed to recognise that Linnaeus' specimen and his own *E. horneri* were identical. He, however, contented himself by remarking " admodum diversa a *Nardo* structura non obstat ; Linnaei enim genera graminum lati sunt ambitus ".

Büse does not tell us why he gave the name *Eremochloa* (from the Greek words, ἐρῆμος, desert, and χλόη, grass) to a plant found in the grasslands of Sumatra which, considering the climate of those parts, could scarcely be called deserts.

The genus now consists of about half a dozen species mainly confined to south-east Asia, of which five are found in India and Burma : one extends from Burma to Australia.

Characteristics of the Genus.

Eremochloa differs from all other genera of the *Andropogoneae* in the type of inflorescence. This consists of a solitary terminal spike of secund spikelets. These spikelets, which overlap in characteristic fashion, are sessile on a rhachis which is tardily fragile. Each is accompanied by a pedicel upon which is seated a rudimentary spikelet. The detached spikelets (except those of *E. muricata*) bear a remarkable resemblance to one of the common ticks of the Indian jungle.

The species can be distinguished from one another by the shape of the lower glume and its appendages. The glume in plan is narrowly or broadly elliptic-ovate or -lanceolate, the texture is coriaceous and the nerves 7. There is a tendency in all the species to develop wings just at the tip. These wings are most marked in *E. muricata*. On the keels of the lower glume are to be found spines which are flattened in *E. muricata* but scabrid and terete in the other species. These spines are curved forward in the plane of the glumes and enhance the resemblance to the ticks already mentioned.

The spikelets recall most strongly those of *Apocopis* Nees. The arrangement of the spikelets in the racemes is similar, the nervation of the lower glumes is the same, the lower floret is male and the upper hermaphrodite in both, the sessile spikelet in each is accompanied by a pedicel which is crowned with the rudiments of a spikelet. On the other hand the inflorescence in *Eremochloa* is solitary and awnless as against the double, twin, curved racemes in *Apocopis*. The appendaged lower glume in *Eremochloa* is quite different from that in *Apocopis*. Moreover, there are three stamens and two lodicules in *Eremochloa* as against two stamens and no lodicules in *Apocopis*.

Generic Description.

Eremochloa *Büse*

Spikelets oblong, elliptic-oblong, lanceolate or ovate in outline, flattened or slightly convex on the dorsal surface, solitary at the nodes of a more or less fragile rhachis, sessile, secund, overlapping, accompanied by a pedicel which is surmounted or not by the rudiments of a spikelet (which may take the shape of a bristle or a mucro), falling together with the adjacent joint of the rhachis and the pedicel ; rhachis-joints curved, clavate, smooth and glabrous or sparsely to very hirsute, bearded or not on the upper margin, forming together a zig-zag rhachis ; uppermost spikelets often deformed and rudimentary. *Florets* 2, the lower male, the upper female or hermaphrodite. *Lower glume* membranous, chartaceous to almost coriaceous in texture, shape of the spikelet, acute, winged or not at the tip, 7-nerved, 2-keeled, narrowly inturned at the margins or the flap almost absent, decorated on the margin with filiform or flattened spines, which are scabrid and antrorsely curved in the plane of the glume towards the tip ; *callus* very short, smooth and glabrous or hirsute ; *upper glume* chartaceous in texture, elliptic-acute, 3-nerved, shallowly navicular, thickly winged on the keel in the lower half or third, very smooth and glabrous, with narrowly interned margins. *Lower floret* always male ; *lemma* and *palea* elliptic-acute in shape, hyaline ; *stamens* 3 ; *lodicules* 2, obliquely truncate-cuneate. *Upper floret* female or hermaphrodite ; *lemma* and *palea* hyaline, equal to or shorter than the corresponding parts of the lower floret ; *styles* 2 ; *stigmas* plumose ; *stamens*, when present, 3 ; *anthers* longer than those of the lower floret ; *lodicules* 2, obliquely truncate, longer than those of the lower floret.

Perennial grasses found in India, Burma, China, etc., with extravaginal innovations, short basal sheaths and flat linear leaves ; *ligule* short membranous, truncate. *Inflorescence* a solitary terminal spike on a long exserted peduncle.

Key to the Indian and Burmese Species of *Eremochloa*.

Leaves up to 8 mm. broad, conspicuously ciliate all along the margins ; pedicel of pedicelled spikelet about the length of the rhachis-joints ; rudimentary spikelet a scabrid seta at an obtuse angle to the pedicel and as long or longer . . . . . 1. *E. ciliatifolia*

Leaves not more than 4 mm. broad and not ciliate all along, occasionally ciliate on the rounded base ; pedicelled spikelet represented by a laminate structure as long as or slightly longer than the sessile spikelet, rarely separable into pedicel and spikelet, or if so, then the spikelet reduced to a very short rudiment :—

Lower glume of the sessile spikelet with a pair of fan-shaped or triangular wings at the apex ; lateral spines flat, pectinate 2. *E. muricata*

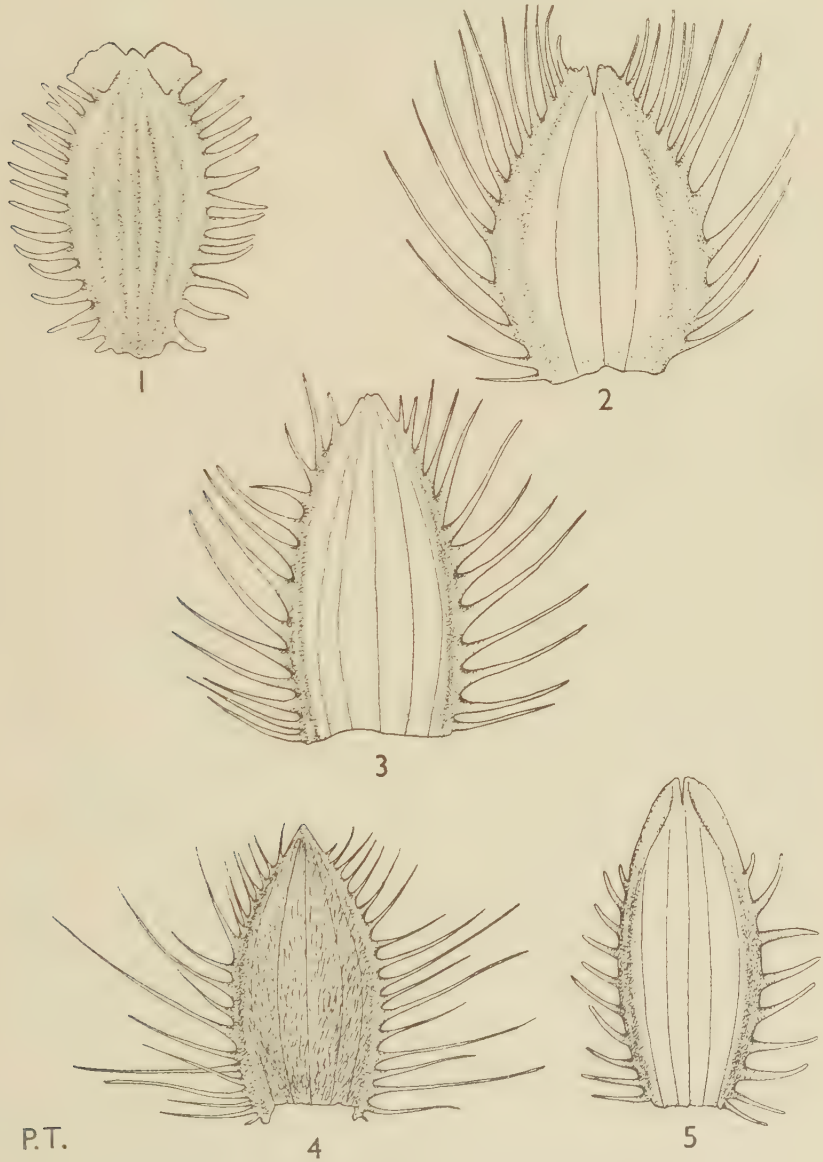
Lower glume very narrowly winged or wingless ; lateral spines terete often slightly expanded at the base :—

Lateral spines as long as the glume is broad :—

Lower glume of sessile spikelet broadly elliptic-oblong, glabrous, with two narrow wings at the apex . . . 3. *E. zeylanica*

Lower glume of sessile spikelet elliptic-acute, usually covered on the dorsal surface with soft white hairs,wingless . 4. *E. ciliaris*

Lateral spines shorter than the glume is broad ; dorsal surface glabrous ; wings at the apex very narrow . 5. *E. bimaculata*



Lower glumes of 1. *Eremochloa muricata* (Retz.) Hack ; 2. *E. ciliatifolia* Hack. ; 3. *E. zeylanica* Hack. ; 4. *E. ciliaris* (Linn.) Merr. ; 5. *E. bimaculata* Hack. ; all × 10.

1. **Eremochloa ciliatifolia** *Hack.* in DC., Monogr. Phan. **6,** 265 (1889).

E. helferi Munro ex Hook. f., Flor. Brit. Ind. **7,** 141 (1896).

Isachaemum helferi Munro in Cat. Griffith, Falconer and Helfer's Plants, 65 (1865) nomen.

A perennial grass from a stout rootstock. *Culms* up to 40 cm. tall, slender, terete, pilose with white hairs, smooth, terete, unbranched, with the uppermost node below the middle of the stem, bearded at the nodes with white hairs. *Leaf-blades* mostly congregated at the base of the plant, those of the culm-sheaths being rudimentary, up to 15 cm. long, 8 mm. broad, linear in shape, somewhat suddenly contracted to a blunt, hooded point, rather stiff, ascending, markedly ciliate along the margins, with spreading hairs from tubercule-bases, rounded at the base, smooth and glabrous on the surface, or with a few hairs near the midrib on the upper surface, with midrib prominent below ; *sheaths* very short at the base, compressed, keeled, loose and slipping from the culms, rather tight on the culm above, shorter than the internodes, markedly striate, smooth and glabrous, thinner and hyaline on the margins, ciliate with tubercle-based hairs on the margins, the upper sheaths carrying rudimentary blades ; *ligule* 1·5 mm. long, membranous, glabrous.

Inflorescence a solitary terminal spike ; *rhachis* tardily fragile, carrying a sessile spikelet and the rudiment of a pedicel and pedicelled spikelet at each node ; *joints* of the rhachis 2·5–3 mm. long, clavate, curved alternately to right and left, shortly but densely bearded with white hairs on the lower margin, pilose on the outer surface, glabrous on the inner surface. *Spikelets* 4·5 mm. long, strongly compressed, overlapping, with a bearded callus 0·5 mm. long ; *lower glume* 4–4·5 mm. long, coriaceous in texture, broadly ovate-acute in shape, 2·5 mm. broad at the widest point, much thickened on the margins and hardly infolded, flat or convex on the dorsal surface, which is absolutely smooth and glabrous, 7-nerved, closely beset along the margins with forwardly directed spines which are scabrid, terete, filiform and slightly thickened at the base, up to 3 mm. long ; *upper glume* 4 mm. long, 1·75 mm. wide, elliptic-acute in shape, 3-nerved, 2-keeled, much thickened on the keels, shortly and narrowly winged on the mid-nerve in the lower half, chartaceous in texture, absolutely smooth and glabrous. *Lower floret* ♂ ; *lemma* elliptic-acute, hyaline, shortly inturned at the margins ; *palea* similar in shape and texture, slightly narrower ; *stamens* 3 ; *anthers* 2·5 mm. long ; *lodicules* 2 ; truncate, cuneate. *Upper floret* ♀ ; *lemma* elliptic-obtuse, hyaline, with a dorsal fold that fits into the recess in the upper glume ; *palea* similar in shape and texture, slightly smaller ; *styles* 2 ; *stigmas* plumose ; *lodicules* 2, obliquely cuneate, truncate. The *pedicelled spikelet* is easily separable into its components—the pedicel is a stipe-like structure 2·5–3 mm. long, usually pilose ; the rudimentary spikelet, on the other hand, is a filiform, scabrid seta set at an obtuse angle to the pedicel, about 3·5–4 mm. long.

Burma : Tenasserim, *Helfer* ; *Griffith* 6776.

With regard to this plant Hackel remarks " Griff. 6776 in h. berol., e h. Kewensi nomine inedito *Ischaemi Helferi* Munro communicato, quod, quia nomenclaturae legibus a congressu botanicorum Parisiensi acceptis contrarium, non recepi ".

Presumably Hackel was referring in this place to the " Lois de nomenclature botanique " adopted at the International Botanical Congress in Paris in 1867. According to Art. 36, sect. 7 of these Laws, it was recommended that a species should not be named after anyone who had not discovered or studied or figured the species. As Hackel founded his

species on Griffith's specimen in the Berlin Herbarium, and did not mention Helfer's, it is obvious that he was not aware that Helfer had collected this very species in Tenasserim.

Hooker, as his distribution of the species shows, was well aware of the facts and sought to put the matter right by calling the grass *Eremochloa helferi* Munro. Actually, however, Munro never made the combination, his identification being simply a name, *Ischaemum helferi* Munro. Unhappily for Hooker's good intentions, Hackel's name, according to the International Rules, must stand

2. **Eremochloa muricata** *Retz. Hack.* in DC., Monogr. Phan. **6,** 262 (1889).

Aegilops muricata Retz., Obs. Bot. **2,** 27 (1781).

Rottboellia muricata Retz., Obs. Bot. **3,** 12 (1783).

Ischaemum pectinatum Trin. in Mem. Acad. Petersb. ser. 6, **2,** 296 (1832).

Andropogon pectinatus Steud., Syn. Pl. Glum. 369 (1854).

A perennial, tufted grass with a thick, woody rootstock and extravaginal innovation shoots. *Culms* up to 45 cm. tall, often decumbent at the base, finally erect, smooth and glabrous, terete, striate, glabrous at the nodes. *Leaf-blades* very numerous below, equitant, linear, up to 15 cm. long, 4–6 mm. wide, tapering slightly to an obliquely 2-lobed tip or to a blunt point, very smooth and glabrous, rounded but not cordate at the base, the upper blades reduced and often lanceolate-acute in shape ; *sheaths* strongly compressed, tight, very striate, smooth and glabrous, very short below, but in any event shorter than the internodes ; *ligule* a very narrow membrane.

Inflorescence a solitary, terminal spike 5–15 cm. long, usually curved, consisting of a tardily disarticulating rhachis, at each articulation of which is a sessile, hermaphrodite spikelet and an imperfect, pedicelled spikelet ; joints clavate, angled, glabrous. *Spikelets* 4·5–5 (6·5) mm. long, strongly compressed with a very short, glabrous callus. *Lower glume* 4·5–5 (6·5) mm. long, 2 mm. broad, not including the marginal spines, elliptic-acute in shape, flat on the back, smooth and glabrous, with a fan-shaped or triangular wing on each side of the tip, 7-nerved, 2-keeled ; auricles truncate, many nerved ; margins decorated with spreading and forwardly directed flat spines which are connate just at the base ; *upper glume* 4·5–5·5 (6) mm. long, 1·5 mm. wide, narrowly elliptic-acute, smooth and glabrous, shallowly boat-shaped, keeled, 3-nerved, with narrowly inturned margins, chartaceous. *Lower floret* ♂ ; *lemma* 4 mm. long, elliptic-obtuse, with inturned flaps, hyaline ; *palea* similar in shape and texture but much shorter ; *stamens* 3 ; *anthers* 1·5–3 mm. long, yellow ; *lodicules* 2, obliquely truncate-cuneate. *Upper floret* ☿ or ♀ ; *lemma* elliptic-obtuse, hyaline 3–4 mm. long ; *palea* similar but shorter ; *styles* 2 ; *stigmas* plumose ; *stamens* 3 ; *anthers* 2–3 mm. long, yellow ; *lodicules* 2, obliquely truncate. *Pedicelled spikelet* reduced to an inflated structure, lanceolate-acuminate or oblanceolate-cuneate, the outer flat surface marked with anastomosing green veins, the inner convex surface smooth, opaque and nerveless.

Ind. Or. : Madras : Alumparva et Sadras prope aquam *Wall.* 8867 (type) ; Herb. *Wight* 1717 ; Govt. Museum Compound, Aug. 1898

A. G. Bourne ; Avadi, Chingleput, Madras, 14 Jan. 1918 ; Velacheri, 31 Oct. 1899 ; Palakuppam Farms, 19 Aug. 1930, *V. Narayanaswami* 4000.

Ceylon : Trincomalee, *Thwaites* 3848 ; Mullaction, in open places on sandy soil, 18 Mar. 1927, *A. A. G. Alston* 1450.

Burma : Legying, Sept. 1902, *Shaik Mohim.*

3. **Eremochloa zeylanica** *Hack.* in DC. Monogr. Phan. **6,** 263 (1889).

Isachaemum falcatum Thw., Enum. Pl. Zeyl. 436 (1864) non Nees.

A perennial grass with a stout horizontal or inclined rootstock. *Culms* slightly decumbent at the base, finally erect, up to 45 cm. tall, slender, terete, smooth and glabrous, 3–4-noded, very leafy at the base, glabrous at the nodes. *Leaf-blades* up to 14 cm. long, 5 mm. broad, linear-lanceolate to linear in shape, tapering to a somewhat blunt point, smooth and glabrous on both surfaces, scabrid on the margins and on the midrib on the under surface near the tip, with several tubercle-based hairs on each side of the rounded base ; *sheaths* keeled below, equitant, smooth and glabrous, striate ; *ligule* membranous, lacerate, 1 mm. long.

Inflorescence a terminal, solitary spike, consisting of a tardily disarticulating rhachis, at each node of which is a sessile spikelet accompanied by a structure which represents the rudiments of a pedicelled spikelet ; joints of the rhachis clavate, 3-angled, smooth and glabrous, curved, 3 mm. long, very shortly ciliate on the lower margin. *Spikelets* 5 mm. long, firmly compressed, with a short, bearded callus. *Lower glume* elliptic-acute in shape, chartaceous to coriaceous, 5 mm. long, 2 mm. wide without the spines, flat on the back, shiny, smooth and glabrous, 7-nerved, with two very narrow wings at the tip, one on each side, 2-keeled with narrowly interned flaps, decorated on the two margins with terete forwardly curved spines which are well separated from one another at the base ; *upper glume* elliptic-acute in shape, 3-nerved, 4·5 mm. long, 3·5 mm. wide, with a peculiar dorsal wing on the keel in the lower third, 2-keeled, narrowly inturned at the margins, smooth and glabrous, chartaceous. *Lower floret* ♂ ; *lemma* a hyaline, elliptic-obtuse scale with infolded, ciliate margins, 3·5 mm. long ; *palea* of the same texture and shape but smaller ; *stamens* 3 ; *anthers* 1·5 mm. long. *Upper floret* ☿ or ♀ ; *lemma* 3·5 mm. long, elliptic-acute in shape, hyaline, with inturned ciliate margins ; *palea* of the same texture and shape, almost as long, but narrower ; *styles* 2 ; *stigmas* plumose ; *lodicules* 2, large, obliquely truncate-cuneate. *Pedicelled spikelet* with pedicel about 5 mm. long, narrowly elliptic-acuminate, often divided into a lower (4 mm. long) inflated portion, the pedicel, and an upper rudimentary glume (1 mm. long) representing the spikelet ; the pedicel inflated, outer surface flat with green anastomosing veins, the inner surface convex, white, smooth, shining.

Ceylon : Colombo, *M. N. Breckett* 2487 ; Konegalu, *Thwaites* 3322 (type).

Ind. Or. : Madras : Herb. Wight 1717. The latter sheet had, according to a note by C. B. Clarke in Herb. Kew., both *E. muricata* (Retz.) Hack. and *E. zeylanica* Hack. upon it. This is the only record from Madras of *E. zeylanica.*

4. Eremochloa ciliaris (*Linn.*) *Merr.* in Philipp. Journ. Sci. **1,** Suppl. 331 (1906).

Nardus ciliaris Linn., Sp. Pl. ed. 1, 53 (1753).

E. horneri Büse in Miquel, Plan. Jungh. **1,** 351 (1854).

Ischaemum leersioides Munro in Proc. Amer. Acad. **4,** 363 (1860).

Eremochloa leersioides (Munro) Hack. in DC., Monogr. Phan. **6,** 264 (1889).

A perennial grass (arising from a stout rhizomatous rootstock), covered at the base with many short, distichous, equitant leaf-sheaths. *Culms* erect or somewhat decumbent at the base, up to 40 cm. tall, terete, smooth and glabrous, striate, glabrous or bearded at the nodes, the uppermost node being about halfway up the stem. *Leaf-blades* linear-acute in shape, most often complicate, up to 11 cm. long, when flattened 2–3 mm. wide, rigid, sub-erect, covered on both surfaces with sparse or dense white hairs, or quite glabrous, smooth or almost so on the obscurely thickened margins, usually with a number of spaced white tubercle-based hairs on the margins at the base ; *sheaths* at the base very short, much striate, with dense, white, fugacious hairs lying along the surface, upper sheaths glabrous or hirsute with soft, white, spreading hairs arising from tubercle-bases, usually compressed and keeled, thinner or almost hyaline on the margins, with a white band at the junction with the leaf ; *ligule* a narrow, lacerate membrane 0·5–1 mm. wide.

Inflorescence a solitary, terminal, falcate spike, consisting of a tardily fragile rhachis, at each node of which is a sessile, hermaphrodite spikelet accompanied by a pedicelled rudiment ; joints of the rhachis 2·5–3 mm. long, clavate, hirsute with white hairs or glabrous on the outer surface, smooth and glabrous on the inner surface, curved, bearded along the lower margin and callus. *Spikelets* strongly compressed, 3·5–4 mm. long, elliptic-acute in shape. *Lower glume* 3·5–4 mm. long, 2 mm. broad, elliptic-acute in shape, without wings at the tip, flat on the back, membranous, thickened on the margins, 7-nerved, glabrous or covered on the dorsal surface with appressed, soft, white hairs, pectinate on the margins with spreading, filiform, forwardly directed spines of unequal length, the lowest up to 3 mm. long ; *upper glume* 4 mm. long, narrowly elliptic-acute in shape, membranous in texture, 3-nerved with the central nerve winged in the lower half or third, smooth or glabrous. *Lower floret* ♂ ; *lemma* 3·5 mm. long, elliptic-obtuse, hyaline ; *palea* similar but narrower ; *stamens* 3 ; *anthers* 1·5–2·25 mm. long. *Upper floret* ♀ ; *lemma* 2·5 mm. long, hyaline ; *palea* a small, hyaline scale ; *styles* 2 ; *stigmas* long, plumose ; *lodicules* 2, truncate, cuneate. *Pedicelled spikelet* and pedicel represented by a somewhat inflated, narrowly ellipsoid structure about the length of the joint or a little longer, showing numerous green veins on the outer surface, smooth, glabrous and opaque on the inner surface.

Burma : Pegu, *Sulp. Kurz* 1129 ; Bwetgyi grazing ground, 15 Jun. 1947, *U Thein Lwin* 29, fairly common on shallow coarse sandy soil in damp places.

5. Eremochloa bimaculata *Hack.* in DC., Monogr. Phan. **6,** 265 (1889).

A perennial grass with stout rootstock and thick roots. *Culms* erect or only slightly decumbent at the base, up to 60 cm. tall, very slender, terete

or compressed (fide Hackel), striate, unbranched, with what appears to be a glandular patch below the nodes, glabrous apart from the nodes and the glandular patches which are hirsute with ascending appressed hairs ; the uppermost node is situated above the centre of the culm. *Leaf-blades* linear-lanceolate in shape, contracted rather abruptly to a blunt point, smooth and glabrous on both surfaces, except at the base, minutely scabrid on the scarcely thickened margin, rather flaccid, thin, spreading, up to 9 cm. long, 3·5 mm. broad, hirsute on the upper surface just at the base and ciliate on the margins for a short distance with tubercle-based hairs ; *sheaths* rather lax, shorter than the internodes, compressed and keeled, smooth and glabrous, markedly striate ; *ligule* membranous, truncate, denticulate on the upper margin, 0·75 mm. long.

Inflorescence a solitary, terminal spike, 5·5 cm. long ; rhachis tardily breaking up ; *joints* 2·5 mm. long, curved, clavate, sometimes subturbinate, smooth and glabrous, bearded on the lower margin. *Spikelets* with a hairy callus 0·5 mm. long, 4–4·5 mm. long, compressed, solitary at each articulation and eventually falling with the adjacent joint and pedicel, with a very short bearded callus. *Lower glume* 4–4·5 mm. long, 1·75 mm. broad, oblong-elliptic-obtuse in shape, flat on the back, 7-nerved, 2-keeled, very shortly and narrowly winged at the apex, very smooth and glabrous, shining ; margins very narrowly inturned, membranous in texture ; *upper glume* 4 mm. long, elliptic-acute in shape, 3-nerved, the lower part of the central nerve with a narrow dorsal wing, smooth and glabrous. *Lower floret* ♂ ; *lemma* 3·5 mm. long, hyaline, elliptic-acute with infolded margins ; *palea* as long as the lemma ; *stamens* 3 ; *anthers* 2 mm. long ; *lodicules* 2, truncate-cuneate. *Upper floret* ♀ ; *lemma* 3 mm. long, elliptic-acute, hyaline ; *palea* shorter and narrower ; *stamens* 3 ; *anthers* 3 mm. long ; *lodicules* 2, obliquely cuneate, truncate, much larger than those in the lower floret. *Pedicel* and *pedicelled spikelet* about 3 mm. long, narrowly ellipsoid in shape with numerous anastomosing veins, the inner surface opaque, shining.

Burma : Griffith 6774 (type).

Griffith's own label is affixed to the type sheet in the Kew Herbarium. It reads " Gramen Rottboellioideum. Plains. Towards Camein. 4.8.1837 ". There is also a note by General Munro which reads " Ischaemum pectinatum Trin. This was mixed up with masses of *Spodiopogon angustifolius* Trin. from Burmah ". Camein is mentioned in Griffith's journals and is apparently near the jade mines not far from Mogaung.

This species is indeed close to *E. zeylanica*, but there can be no doubt that they represent different species. The differences are tabulated below :–

E. zeylanica	*E. bimaculata*
Spikelets 5 mm. long	Spikelets 4–4·5 mm. long
Lower glume 2 mm. wide, chartaceous to coriaceous	Lower glume 1·75 mm. wide, membranous
Anthers 1·5 mm. long	Anthers 3 mm. long
Spines on margins of the lower glume up to 2·5 mm. long	Spines on margins of the lower glume up to 1 mm. long
Nodes glabrous	Nodes hirsute.

The type specimen is the only gathering of this species in Burma. This, in itself, is not surprising, for the Kachin Hills have not been systematically explored, but if, as is stated, the species extends through Siam into Australia, it is strange that it has not been found elsewhere in Burma south of the type locality.

NOTES ON ASIATIC GRASSES : IX.

The genus Lopholepis Decne.

N. L. Bor.

Lopholepis, from the two Greek words λόφος crest, and λεπίς scale, was the name proposed for this extraordinary genus by Decaisne in *Archiv. Mus. Hist. Nat. Paris*, **1,** 147 (1839).

It was not, however, the first name that had been given to this plant, for Hooker had called the genus *Holboellia* in *Bot. Misc.* 2, 144 (1831). How he came to give this name to the genus is interesting. The specimens upon which this generic name was based, were sent by Dr. Wight to Hooker, and as the latter could not find anything inside the flowers (i.e., the spikelets), he asked Dr. Wallich if he happened to have any further specimens of the grass in his herbarium. Moreover, Hooker wished to dedicate the genus, should it prove to be new, to Dr. Wight who first collected it, and again consulted Wallich as to the propriety of this proposal.

This is how Dr. Wallich replied.* " In the packet you will receive from Hunneman** are five specimens of the most lovely grass from Wight, of which you sent me a fragment. Never in my life have I seen anything more lovely or beautiful in that tribe. I immediately showed it to Brown, who was exceedingly struck with it. I thought I had given him all Wight's grasses together with my own, but I found this was not the case. So I looked over all the former many glorious new things there are among them, and found beautiful specimens of the grass you kindly sent. Mr. Brown says 'novissimum genus'. You will find there is already a Wightia in my 4th number*** viz. *gigantea* Wall. ex *bignoneacearum*, and therefore our friend is already incorporated with a genus. But I will tell you what you may do, if you have not a particularly worthy individual at hand you wish to call it after, call it *Holboellia*. I will tell you what Brown, long ago, intimated to me, and what he repeated to-day, that the genus so-called by me in Tent. fl. nepalensis illustratae, fasc. 1, is NOT distinct from *Stauntonia*. See what I say on this matter loco citato, likewise see what I have said in dedicating the genus. Poor

*Extract from a letter from N. Wallich to Sir William Hooker dated 61 Frith St., Soho, 13th Oct., 1830, in the Hooker correspondence preserved at Kew.

**John Hunneman (d. 1839). Bookseller and agent for dried plants. A.L.S. 1831.

***Wallich was referring to volume I, part 4 of Plantae Asiaticae Rariores p. 71, t. 81, which was published in 1829.

Holboel was my friend and preceptor ; he was gardener in the Royal Botanic Garden of Copenhagen. A more worthy or excellent man never breathed, and a truly excellent and practical botanist. Now, what I want you to do (provided, as I have said above, you have not a friend or acquaintance to whom you wish to dedicate the grass in question) is this : call it YOURSELF *Holboellia* and add that you have pleasure in complying with a request from Wallich on this occasion, he having ascertained from Mr. Brown that the genus which he called *Holboellia* is not different from *Stauntonia*. Otherwise *Ornithochloe*, or some such name, would be applicable—for does not the floret look like the beak of a bird? But, mind you, on no account let it be supposed that any of the above names is given by me ".

Despite the admonitions in the latter part of this letter, and particularly in the last sentence quoted, Hooker actually did cite Wallich as the author of this genus. Possibly he wished Wallich to have the gratification of being associated with Holböl's name in the new genus.

This generic name, *Holboellia* Wall., was not to stand very long, for Decaisne published the following note in the work mentioned above : —

" Cette réunion de l'*Holböllia* au *Stauntonia* doit avoir eu lieu de la part de M. le Docteur Wallich, puisque M. Hooker établit, dans le tome 2 du *Bot. misc.* un genre nouveau de Graminées de l'Inde, nommé *Holböllia* dans le manuscrit de M. Wallich, et publié longtemps apres le *Tentamen Florae nepalensis*. Or, comme je regarde le genre de Lardizabalée, créé antérieurement par M. Wallich, comme parfaitement distinct du *Stauntonia*, je me crois en droit de restituer le nom d'*Holböllia* et de proposer, pour le genre établi dans le *Botanical miscellany*, sur la Graminée de l'Inde, le nom de *Lopholepis*, tiré du caractère remarquable de la crête qui surmonte les paillettes de cette plante pour laquelle M. W. Griffith a donné une analyse complete."

Incidentally, I have not been able to discover where Griffith gave a complete analysis of this grass, and can only surmise that Decaisne wrote the name Griffith in error for Hooker.

With regard to the generic name *Holboellia* Wall., modern botanists are agreed that it is a perfectly good genus of the *Lardizabalaceae*. Happily, therefore, Wallich's intention to commemorate the name of his friend and preceptor, is fully realised.

Strangely enough, although Decaisne changed the name of the genus in the *Achiv. Mus. Hist. Nat. Paris*, **1,** 147 (1839) and the name *Lopholepis* Decne. was taken up by Endlicher in *Gen. Pl.* **2,** *Suppl.* 1, 1353 (1840), neither of these botanists seems to have made the new combination in *Lopholepis*. The first author who appears to have done this is Steudel, and the correct name for this grass should be *Lopholepis ornithocephala* (Hook.) Steud.

What purpose is served by the extraordinary shape of the spikelet, for it cannot be regarded as anything but fantastic, is not known. In view of the very restricted range of the only species of the genus, it is obvious that it has not been very successful in colonisation.

The spikelet does not break up at maturity, but falls entire with the grain enclosed between the glumes. If a spikelet be allowed to drop, it spins in a spiral, and this is, without any doubt, a device to secure wide

distribution, since the spinning spikelet falls more slowly and therefore can take advantage of any air movements. The hairs or fine spines on glumes and stipe may also attach themselves to clothes, and possibly to the fur of animals. It is surprising, therefore, that the grass is restricted to such a small area.

Lopholepis *Decne.*

Holboellia Wall. ex Hook. in Bot. Misc. **2,** 144 (1831) non Wall., Tent. Flor. Nep. 23 (1824).

Spikelets minute, 1-flowered, hermaphrodite or female, each fused to a stipe which is articulate on a short pedicel, forming a simple many-spiculate raceme ; rhachis of the raceme stout, tough, with many short pedicels articulated to the base of the stipes of the spikelets, striate, very scabrid ; spikelets and stipe falling together ; stipe as long as or longer than the spikelet, flattened, pectinately ciliate on the angles. *Glumes* different in shape and size, chocolate brown when mature, the lower with a prominent, inflated but compressed, pectinately ciliate boss in the lower half, separated from the distal compressed beak-like portion by a depression ; both boss and beak crested and pectinately ciliate ; cilia flattened and often hooked at the tip ; *upper glume* much smaller with a deep excavation in the lower half, the upper half compressed, crested and pectinately ciliate ; boss papillose ; beaks shortly hirsute, scabrid. *Lemma* very short, oblong-acute or elliptic-acute, nerveless, hyaline, glabrous ; *palea* very short, hyaline, oblong-acute or -truncate ; *stamens* 2 or 3 ; *anthers* very small, oblong ; *styles* 2, separate ; *stigmas* plumose ; *lodicules* not seen, probably present as beak opens widely at anthesis ; *grain* as long as the lemma with a broad base, which is wholly occupied by the embryo, flattened abaxially, deeply excavated adaxially, curved over the excavation in the upper glume ; hilum punctiform at the base of the excavation.

Annual, erect, tufted grasses. *Leaf-blades* flat, acute, glaucous, rather firm ; *sheaths* rather loose, long above, short below, striate, glaucous, glabrous ; *ligule* short, membranous. Inflorescence of a long simple raceme of many stipitate spikelets, chocolate brown in colour.

Distribution

So far restricted to a small area comprising the southern tip of India and the northern tip of Ceylon and possibly rare.

Lopholepis ornithocephala *(Hook.) Stead.*, Syn. Pl. Glum. 112 (1854).

Holboellia ornithocephala Hook. in Bot. Misc. **2,** 144 (1831).

An annual grass. Culms usually many, erect or slightly decumbent at the base, up to 50 cm. tall, terete, smooth and glabrous, very striate, glabrous at the nodes ; topmost node below the centre of the culms ; nodes crowded at the base. *Leaf-blades* lanceolate-acute, flat, rounded at the base, up to 2·5 cm. long, 5 mm. wide, undulate on the margins, very finely nerved, smooth and glabrous on both surfaces, furnished with minute hooks on the margins, rather glaucous and stiff ; uppermost *leaf-sheath* spathe-like, rather loose, at first enclosing the inflorescence, smooth and glabrous, striate, glaucous, furnished with a reduced blade,

Lopholepis ornithocephala (Hook.) Steud.

1. Plant × 1. 2. Leaf-blade × 2. 3. Uppermost leaf-blade × 2. 4. Section of stem below inflorescence × 10. 5. Inflorescence × 1. 6. Portion of the inflorescence showing rhachis × 3. 7. Spikelet × 18. 8. Lower glume from the inside ; ovary very young, × 18. 9. Upper glume from the inside × 18. 10. Lemma × 18. 11. Palea × 18. 12. Young ovary, style and stigmas × 48. 13. Longitudinal section of the grain × 24.

the lower much shorter, loose, slipping from the culms, markedly striate, often overlapping at the base of the culms ; *ligule* a very narrow membrane.

Inflorescence a simple, terminal, raceme up to 15 cm. long ; rhachis straight, ridged or flanged, ciliate or scabrid on the flanges, each flange ending in a short pedicel ; pedicels 0·3–0·5 mm. long, scabrid, minutely puberulous or subglabrous, articulated to the base of the stipe of the spikelet. *Spikelets* 1-flowered, hermaphrodite or female, shaped roughly like a bird's head, divisible into two parts, stipe and spikelet proper, fused not articulated to one another ; stipe 1·5 mm. long, compressed, slightly wider above than below, striate, green, thickly ciliate along the margins, at first erect, then declinate ; spikelet proper shaped like a bird's head, 2 mm. long, becoming chocolate-brown in colour at maturity. *Lower glume* 2 mm. long, coriaceous, consisting of a compressed crested globose boss produced distally into a compressed, crested beak, both beak and head verrucose or minutely papillose, scaberulous, thickly pectinately ciliate on the crests ; cilia flattened at the base, hooked at the apex ; *upper glume* much shorter, oblong-acute in plan, compressed and boat-shaped in the distal three-quarters, with a deep concavity in the lower quarter, keeled, crested and pectinately ciliate on the crest in the distal three-quarters, 2·5 2·75 mm. long, turning chocolate-brown at maturity, minutely scabrid with short, sparse, forwardly directed, spines. *Lemma* much shorter than the glumes, 1–1·25 mm. long, oblong- or elliptic-acute, without apparent nerves, hyaline ; *palea* less than 1 mm. long, hyaline ; *stamens* 2 ; *anthers* turgid 0·2–0·3 mm. long, yellow ; *styles* 2 ; stigmas obscurely plumose ; *lodicules* not seen ; *grain* 1·25 mm. long, ovate-oblong-obtuse in shape, compressed, deeply excavated on the adaxial face, flattened on the abaxial surface above the embryo ; embryo forming the base of the grain ; hilum at the base of the excavation, small, punctiform.

Ind. Or. : Madras, Palmacotta, Oct. 1835, *Wight* ; Herb. Wight 1741 ; Naloon, Tinnevelly, Dec. 1882, native collector ; Tuticorin, May, Jun. 1835, Herb. Wight.

Ceylon : Mannar, Northern Province, Feb. 1890, *Trimen.*

NOTES ON ASIATIC GRASSES : X

A confused species of Isachne R. Br.

N. L. Bor.

This short paper is concerned with *Isachne pulchella* Roth and the reason for its title is that the name is treated in the Index Kewensis and in the Flora of British India as a synonym of *Sphaerocaryum elegans* Nees (now correctly known as *S. malaccense* (Trin.) Pilger, a name based on the earlier *Panicum malaccense* Trin.). Indeed the combination *Sphaerocaryum pulchellum* (Roth) has been made by Merrill in *Philipp. Jour. Sci.* **11,** 52

(1916) and by A. Camus in Lecomte, *Flor. Génér. de l'Indo-Chine* **8,** 514 (1923).

Isachne pulchella was sent with other grasses and dicotyledonous plants to A. W. Roth by Dr. Benjamin Heyne, a missionary in Tranquebar, Madras State. Roth incorporated Heyne's plants with full descriptions in a small booklet entitled *Novae Plantarum Species* which was published in 1821. While it was still in manuscript, however, Roth lent it to Roemer and Schultes who were engaged upon producing the 15th edition of Linnaeus' *Systema Vegetabilium*. This edition was printed and published in 1817. Roemer and Schultes took up all the new names proposed by Roth and the *Systema Vegetabilium* ed. 15 has priority in respect of date of publication of these species. In fact the only advantage in Roth's *Novae Plantarum Species* lies in the longer and more accurate descriptions.

The Herbarium of A. W. Roth was purchased by Berlin from the Naturhistorisches Museum zu Oldenburg in 1925, and was incorporated in the general Herbarium. During the recent war, in 1943 to be precise, this Herbarium suffered severely in the bombing of Berlin, and a large part of the collections was destroyed. Through the kindness of the present Director, Prof. Dr. Werdermann, what remained of the grasses in Roth's Herbarium was made available for study.* Among the few which survived was the type of *Isachne pulchella* Roth. Far from this being a specimen of *Sphaerocaryum*, as Hooker supposed, it is not only a species of *Isachne* but is moreover a perfectly good species which has been neglected and is not treated in any of the floras of India.

The lending of Roth's work in manuscript to Roemer and Schultes and the prior publication of the latter's work led to some curious errors. In his book Roth does not cite the author of new new species immediately after the name. He does, however, indicate underneath the description of each species to whom the credit of authorship should go. Heyne, for example, named many of the grasses—sometimes Roth accepted these names, sometimes not, and yet again he gave new names to unnamed specimens.

With regard to *Isachne pulchella*, Roth says " absque nomine communicavit Cel. Heyne, ex India orientali " whereby it is obvious that he intended that the species should be called *Isachne pulchella* Heyne. Unfortunately the name as published by Roemer and Schultes is *I. pulchella* Roth and as such it must stand.

Isachne pulchella *Roth ex Roem. et Schult.*, Syst. Veg. ed. 15, **2,** 476 (1817) : Roth, Nov. Pl. Sp. 58 (1821).

Apparently an annual. *Culms* slender, up to 25 cm. tall, prostrate below, eventually upright, smooth and glabrous except on the nodes which are thickly beset with short, downwardly directed tubercle-based hairs, striate, with a darker coloured, narrow, glandular band about 1 mm. below each node, branching. *Leaf-blades* broadly elliptic-acute, elliptic-oblong-acute or broadly lanceolate-acute, up to 2·5 cm. long, 10 mm. wide, rather thin, green or greyish-green in colour above, distinctly glaucous below, thickened on the undulate margins, covered on the nerves of both surfaces with exceedingly minute hairs from minute

* A short account of the Indian grasses in Roth's Herbarium is being prepared.

Plate I

Photograph of the type specimen of *Isachne pulchella* Roth.

To face page 322]

tubercle-bases, with a few long cilia on the rounded to subcordate base ; *sheaths* somewhat inflated and very much shorter than the internode, markedly striate, beset with numerous tubercle-based hairs between the striations, to almost glabrous, thickly ciliate with tubercle-based hairs on the outer margin of the sheath ; *ligule* a row of stiff cilia.

Inflorescence an oblong-ellipsoid or ellipsoidal panicle 3–7 cm. long, 0·5–3 cm. wide, at first very compact, finally loosely spreading, consisting of a central axis upon which are alternately arranged, ascending branches; axis channelled, smooth and glabrous ; branches about 2·5 cm. long, straight or slightly flexuous, smooth and glabrous, sparingly rebranched, often with a glandular band towards the tip, spreading almost at right angles at maturity ; pedicels capillary, smooth and glabrous, with 1–3 glandular bands. *Spikelets* secund, crowded, 1·5–1·6 mm. long. *Lower glume* 1–1·2 mm. long, herbaceous, broadly elliptic-obtuse, curved on the back, smooth and glabrous, 5-nerved : *upper glume* similar in shape and texture, 7-nerved, 1·25 mm. long. *Florets* 2, heteromorphous. Lower floret ♂ ; *lemma* thinly chartaceous, 1·5 mm. long, elliptic in outline, with inturned margins, 5-nerved ; *palea* of same texture and shape but narrower, 2-nerved, with infolded margins ; *stamens* 3 ; *anthers* 0·3–0·4 mm. long. *Upper floret* ♀, plano-convex ; *lemma* coriaceous to crustaceous, 1 mm. long, convex on the back, shortly hairy, white ; *palea* elliptic in outline, of the same texture ; *styles* 2 ; *stigmas* 2, plumose, very short ; *lodicules* 2, extremely minute.

Ind. Or. : Madras State ; Tranquebar, *Heyne* (Typus in Herb. Berol., ; Godaveri Dist., Kota, 8 Oct. 1920, *V. Narayanaswami* 520.

Assam : Manipur, Kangpokpi, 5 Oct. 1935, *N. L. Bor* 6525 ; Naga Hills, Mokokchung, 1500 m., 22 Sept. 1942, *N. L. Bor* 16682—a grass gregarious at the margins of marshes.

Burma : Pegu, *Kurz* 1152 ; Tenasserim, *Helfer*.

Narayanaswami's sheet from the Godaveri District, Madras State, is a perfect match for the holotype. The Assam specimen is more mature than either of the others, but there is no reason to doubt that it is any other than *Isachne pulchella* Roth. This species is apt to be confused with *I. miliacea* Roth, but the spikelets are only 1·5 mm. long as against 2 mm. long, while the anthers of the lower floret in *I. miliacea* Roth are 1 mm. long, three times as long as in *I. pulchella* Roth.

An Unguiculella on a Meliola.

When Hansford (1946) compiled his monumental survey o the foliicolous Ascomycetes he knew of only two members of the Helotiales occurring as hyperparasites on leaf fungi viz : *Gloeopeziza ugandensis* Hansf. and *Calloriopsis gelatinosa* (Ell. & Mart.) Syd. It was therefore interesting to encounter among the collections made by Dr. S. J. Hughes on the Gold Coast a single gathering of an *Unguiculella* sp. intimately associated with a *Meliola* on which it is probably hyperparasitic. Unfortunately the available material is scanty and has not yielded mature ascospores. Hence it seems best to await further collections before proposing the fungus as a new species. It is, however, so distinctive and easily recognised that a brief description of it is published here in the hope that other collectors of African Meliolines may keep a watch for it and secure more mature apothecia. Possibly these should be sought on old or fading leaves.

The apothecia are scattered over the *Meliola*, saucer-shaped, with flat dingy yellow disc about 300μ diameter and whitish minutely downy receptacle seated on a peg-like base. The excipulum is composed of more or less prismatic, thin-walled, brown cells, completely clothed with hyaline hairs 2·5–3μ wide at the base but soon narrowed to a very slender, limb recurved at the tip, the total length up to 25μ ; hypothecium of slender, woven, hyaline hyphae, asci cylindric-clavate, almost sessile, rounded above, about 35 $\times$ 6μ, the pore not blue in Melzer's reagent, ascospores not clearly seen but what appear to be immature spores are cylindric-fusiform, 7–8 $\times$ 1·5μ, paraphyses hyaline, cylindrical, 1·5–2μ wide for the length of the asci, then suddenly narrowed to a filiform recurved tip like those of the excipular hairs. On a sterile *Meliola* on leaves of *Glyphaea lateriflora* (Tiliaceae), S. J. Hughes 765, 19.5.1949.

R. W. G. Dennis.

Explorer's Hampshire.*—This book introduces the reader to Hampshire, giving an account of its cities, its rivers and pleasant villages with all the historic connections to be found within its boundaries.

The author tells us of the charms and rich associations of the county, of Winchester, England's ancient capital, the hills, the churches, and of Hampshire's homes and gardens. We are taken in fancy to the Isle of Wight, " the garden isle ", to Osborne House with memories of Victorian days and we are reminded that in Bonchurch Swinburne died and Dickens set himself to write *Great Expectations*. There is much of interest concerning the New Forest, famed for its sturdy ponies, while the account of the folk of the forest and its trees makes very pleasant reading. It is truly said that Hampshire's " history has highlights by the hundred " beginning from the time of Alfred. Warships in far off days were built with oak from the New Forest, a forest still finely-timbered and served with tolerable roads.

The book, which is provided with 31 illustrations and maps will encourage many to explore this delightful county with its fascinating beauties and treasures.

H. S. Marshall.

*Explorer's Hampshire. By Martin Thornhill. London : Skeffington & Son Ltd. 1952. Pp. 192, 31 illustrations and maps. Price 15/-.

THE LASCHIA COMPLEX IN TRINIDAD AND VENEZUELA.

R. W. G. Dennis.

Filoboletus *Henn.* in Monsunia **1,** 146 (1909).

Type species : *F. mycenoides* Henn.

Filoboletus gracilis *Klotzsch ex Berk.) Singer* in Lloydia **8,** 216 (1945).

Polyporus gracilis Klotzsch ex Berk. Ann. Mag. Nat. Hist. **3,** 384 (1839).

Polyporus flexilis Fr. var. *gracilis* (Klotzsch ex Berk.) Sacc., Syll Fung. **6,** 69 (1888).

Leucoporus gracilis Klotzsch ex Berk.) Pat., Essai Hymenom. 82 (1900).

Pileus 4 cm. diameter, convex with a small pointed umbo, smooth, russet ; flesh thin, concolorous, soft and flexible ; pores minute, about 250μ across and not exceeding 500μ deep ; stipe slender, smooth, cartilaginous, hollow, concolorous. Spores globose, 5·5–6μ, hyaline, blue-amyloid, print white, basidia fourspored, 15 – 5μ, cheilocystidia thin-walled, vesiculose, about 20 × 7μ, trama of loosely woven hyphae 5–15μ wide, those of the subhymenium and pore walls with rather thick hyaline walls, embedded in a gelatinous matrix, similar more compact hyphae non-gelatinised form the pileus surface. On logs. Collections seen :—Trinidad, Cerro del Aripo 23.X.1949, Dennis 229. Singer (op. cit.) states the pileus to be at first white and cites *Laschia clypeata* Pat. and *Polyporus obolus* Ellis et Macbride as synonyms. In spite of its porous hymenophore the fungus obviously belongs to the Agaricaceae and is allied to *Mycena*.

Filoboletus manipularis *(Berk.) Singer* in Lloydia **8,** 215 (1945).

Favolus manipularis Berk. in Hooker's Journal of Botany **6,** 229 (1854).

Polyporus mycenoides Pat. in Bull. Soc. Myc. France **3,** 169 (1887).

Porolaschia manipularis (Berk.) Pat. Essai Hymen. 138 (1900).

Pileus 1·3 cm. wide, conico-campanulate, smooth, translucently reticulated by the pores, isabella colour, flesh thin, concolorous, hygrophanous ; pores about 1 mm. wide and up to 3 mm. deep, adnate to the stipe, rather paler than the pileus ; stipe equal or slightly attenuated upwards, smooth, hollow, orange cinnamon below, whitish at the tip. Trama somewhat gelatinous. No cystidia. Basidia 4 spored, about 7μ wide. Spores ellipsoidal, 6–8 × 4–4·5μ, blue amyloid.

Collection seen : a single sporophore on a rotting log, El Junquito, 1600 m. Dto. Federal, Venezuela, 16.XI.1949, *Dennis* 353.

For this determination I have to thank Dr. R. Singer who cites as synonyms *Favolaschia caespitosus* Berk. and *Laschia lauterbachii* Henn. He has asked me to publish the following critical notes which supplement the description in Singer (1945). " According to Lloyd, who saw the type, this species was first described by Berkeley as *Favolus manipularis*. Singer studied the type of *Polyporus mycenoides* Pat. The first mycologist to study the species from fresh material was Heim whose macroscopical description coincides excellently with the notes and sketches by Dennis on his Venezuelan collection. The differences between Heim's and Dennis' notes are negligible : the pileus is more pale umber brown in Dennis' specimen and the stipe, or at least its lower part, is more intensely

coloured (about as in *Filoboletus gracilis* (Klotzsch ex Berk.) Sing.) Dennis' specimen has amyloid spores without suprahilar depression (6·6–8·8 × 4·2–4·8μ, basidia clavate, 4-spored, 23–29 × 7–7·7μ, hymenophoral trama regular and consisting of rather voluminous broad nonamyloid hyphae. The epicutis elements of the pileus are evidently fugacious and detersile as well as scattered rather than forming a continuous layer : they are large saccate echinulate hyaline bodies reminding one at the same time of the dendrophyses of the Favolaschias and of the epicutis elements of *Mycena tenerrima*. The underlying cuticle consists of a well pigmented hypoderm beneath a poorly developed layer of repent rather thin hyphae. The hypodermal hyphae are so voluminous and broad as to give the false impression of forming an epithelium. Their pigmentation is accentuated by Melzer's reagent but I have never seen a layer of amyloid, i.e. lilac-red, hyphae in the hypoderm as indicated by Heim.

The species is evidently widely distributed and has been reported from Australia (Type of *F. manipularis*), New Guinea, New Caledonia, Philippine Is., Ceylon, Madagascar (Heim) and the Ivory Coast (Heim). To this old world distribution a South American locality is now added."

Dictyopanus *Pat.* Essai Hymenom. 137 (1900).

Type species : *Polyporus rhipidium* Berk.

Dictyopanus pusillus (*Lév.*) *Sing.* in Lloydia **8,** 224 (1945).
Gloeoporus pusillus Lév. in Ann. Sci. Nat. Bot. Ser. 3, **2,** 195 (1844).
Polyporus subpulverulentus Berk. et Curt. J. Linn. Soc. Bot. **10,** 306 (1869).

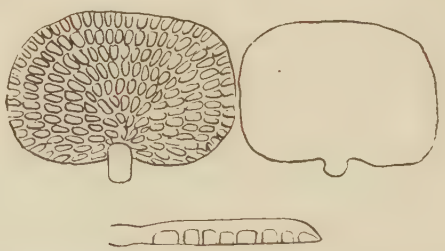


Fig. 1. *Dictyopanus pusillus* Dennis 421. Sporophore and section × 4.

Pileus 5–6 mm. wide, reniform, slightly convex, white to pale buff, surface very finely tomentose ; flesh thin, pale buff under the white surface layer ; pores minute, somewhat radially elongated, very shallow, pale buff ; stipe very short, lateral, equal, smooth, pale buff. Spores elliptical, about 4 × 2·5μ, deeply blue-amyloid, print white, basidia fourspored, 20 × 4μ, no cystidia ; pileus surface of loosely woven slender diverticulate hyphae, trama of hyaline interwoven hyphae 2μ wide, slightly gelatinised between the pores. In swarms on dead branches. Fig. 1.

Collections seen :—Trinidad, Morne Bleu, 4.XII.1949, *Dennis* 421 ; Brazil, Rio Negro, *Spruce* 809 ; *Spruce*, Amazon (Herb. Berk. as "*P. rhipidium* minor") ; Venezuela (Herb. Berk.) ; Cuba, *Wright* 100, 101, 102 (as *P. rhipidium*), 382 (as *P. subpulverulentum*).

According to Singer this species is common throughout the eastern and western tropics while *Polyporus rhipidium* Berk. of N. America is only a larger variety of the same fungus. He cites as a synonym *Laschia guarantica* Speg.

Arrhenia Fr. Sum. Veg. Scan. 312, (1849).

Arrhenia was founded by Fries on three species, *A. auriscalpium* Fr., *A. tenella* Fr. and *Merulius cupularis* Wahlenb. The latter, which was selected as the type by Clements & Shear (1931) looks in Wahlenberg's figure like a resupinate *Pleurotus*. It would probably be wiser to choose as type species *A. auriscalpium* Fr. the only one which Fries had seen for himself. Singer (1945) adopts the genus for tropical members of the Laschia complex with a veined hymenium, gelatinous flesh, hyphal cuticle and non-amyloid spores, intermediate between *Campanella* and *Cyphella*. He refers *Arrhenia* to the Cyphellaceae. In dealing with it here I am not disputing that decision but it is convenient to treat all the poroid fungi of " Laschia " aspect together.

Arrhenia flabellula (*Berk. et Curt.*) comb. nov.
Laschia flabellula Berk. et Curt. Cke. in Grevillea **19,** 105 (1891).

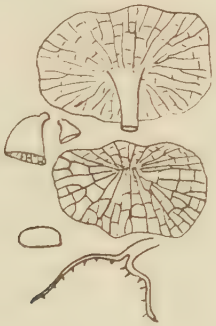


Fig. 2. *Arrhenia flabellula* Dennis 225. Sporophores and section × 2, spore × 660.

Pileus up to 15 mm. diameter, bell shaped, pendulous with a short slender smooth central white stipe. Ventral surface smooth, white, dry, soon becoming uppermost in growth position owing to the curvature of the stipe, dorsal surface covered with close narrow reticulate veins, white, soon facing downwards in growth position, flesh very thin, soft, white. Spores elliptical, 6–8 × 3–3·5μ, non-amyloid, print white, tramal hyphae 3μ wide, hyaline, thin-walled, loosely woven in a mucilaginous matrix, cuticle of the ventral surface formed of thin-walled prostrate hyphae up to 8μ wide with scattered inflated cells 40–85 × 25–30μ. The whole fungus dries pinkish buff. In swarms on logs in forests. Fig. 2.

Collections seen :—Trinidad : Cerro del Aripo 23.X.1949, Dennis 225 ; Naranja 27.XI.1949, Dennis 225 A; Venezuela : in Herb. Berkeley as *Favolus flabellulum* Berk. et Curt. unpublished. Dr. Singer informs me that the type of *Arrhenia cyphelloides* Lloyd is the above fungus.

Favolaschia (*Pat.*) *Henn.* in Eng. Bot. Jahrb. **22,** 93 (1895).

Laschia sect. *Favolaschia* Pat. Journ. de Bot. I p. 231, 1887.

Porolaschia Pat. Essai Hymen. p. 138, 1900.

Type species. *Laschia gaillardii.* Pat.

Singer (1945) has thoroughly described and keyed nine species of *Favolaschia* from tropical America of which *F. sprucei* (Berk.) Sing. and *F. gaillardii* (Pat.) Pat. were from Venezuela and *F. sabalensis* (Charles) Sing. from Trinidad. He has kindly examined my collections of the genus and recognised amongst them *F. saccharina* Pat., *F. vararioteeta* Sing. and a new species described below in his honour.

Key to the species yet known in Trinidad and Venezuela, adapted from Singer (1945) :

I Dendrophyses none, gloeocystidia smooth, sporophores 10–50 mm. broad, on dead wood . . . . . *F. sprucei* (Berk.) Sing.

II Dendrophyses numerous and well developed or gloeocystidia crested, sporophores less than 10 mm. broad :

A. Sporophores white or very pale cream coloured when fresh :

1. Trama gelatinous, cuticular layer formed of short-branched hyphae (dichophyses) . . . . . *F. vararioteeta* Sing.

2. Trama non-gelatinous, pileus surface of mealy warted sphaerocysts :

a. Pileus 2 mm. across and over, stalked, on Dicot. sticks *F. singeriana* var.

b. Pileus smaller, sessile or very short stalked :
Gloeocystidial hyphae blue in cresyl blue . *F. saccharina* Pat.
Gloeocystidial hyphae with pink walls and hyaline or lilac contents in cresyl blue . . . . . *F. singeriana* Dennis

B. Sporophores coloured red, orange or golden-yellow when fresh, sometimes drying whitish :

1. Pigment not localised in the gloeocystidia, sporophores sessile, gelatinous, 4–5 mm. diameter, on dead branches and stumps *F. gaillardii* (Pat.) Pat.

2. Pigment localised in the gloeocystidia, sporophores laterally stipitate, 1–4 mm. diameter, on *Sabal palmetto.* *F. sabalensis* (Charles) Sing.

Favolaschia vararioteeta *Singer* in Lloydia **8,** 201 (1945).

Sporophores reniform to orbicular, 1–2 mm. diameter, varying from sessile and dorsally attached to laterally stipitate, whitish drying buff, upper surface smooth or very minutely pruinose towards the margin, translucent and marked by faint reticulate furrows corresponding to the dissepiments, under surface occupied by up to about 40 crowded slightly angular shallow pores, the margin of the dissepiments distinctly pruinose ; stipe when present slender, smooth, curved, pale buff.

Spores ellipsoid, guttulate, 5·5–7·5 × 4·5–5·5μ, blue-amyloid, basidia four-spored, 25 × 8μ, dissepiment margin covered with clavate, finely

warted, thin-walled hyaline cells about 16–25 × 6–8μ; gloeocystidia abundant in the hymenium, 18–45 × 5–13μ, tramal hyphae slender, about 1–2μ thick, loosely woven in a gelatinous matrix, cuticular layer composed of a zone 30μ deep of short-branched hyaline thin-walled hyphae 3μ wide. In swarms on dead palm petioles. Fig. 3.

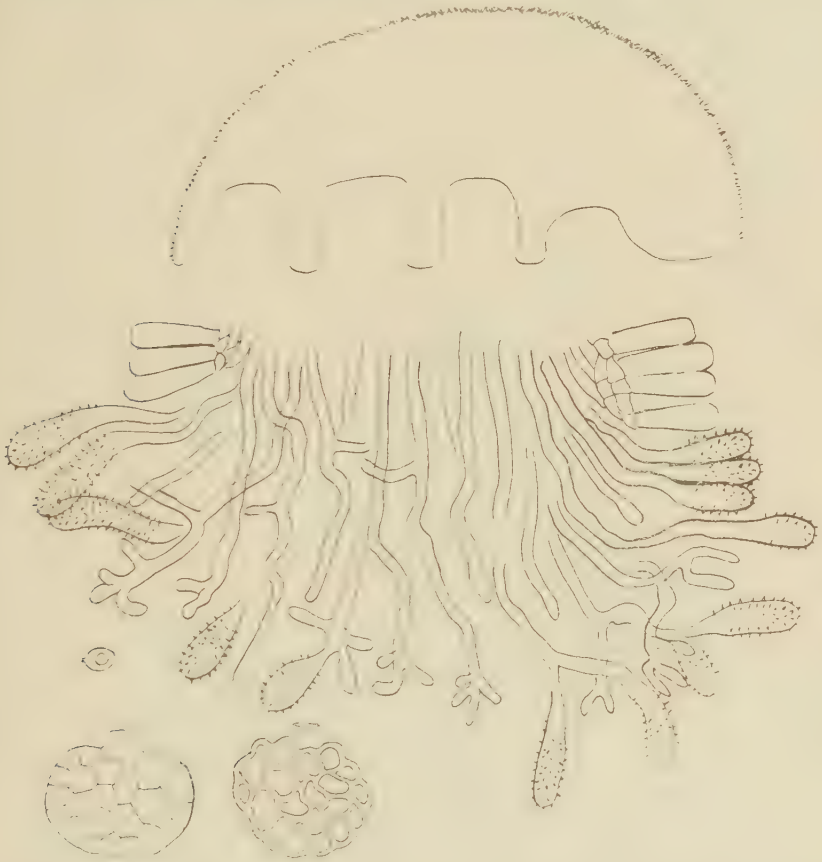


Fig. 3. *Favolaschia vararioteeta* Dennis 95 A. Vertical section of sporophore × 50, section of dissepiment edge and spore × 660, upper and lower views of sporophore × 12.

Collection seen :—Trinidad, Naranja, 2000 ft., 2.X.1949, *Dennis* 95 A.

Singer, who kindly confirmed the determination, comments that the Trinidad material has a more abundant development of dendrophysoid-bodies at the pore mouths than the type. It is evidently a more luxuriant development for the type collection from Grenada was described as only 1 mm. diameter and rarely stipitate.

Favolaschia saccharina *Pat.* in Bull. Herb. Boissier **3,** 54 (1895).

Laschia saccharina (Pat.) Sacc. et Syd., Syll. fung. **14,** 197 (1899).

Laschia gemma von Höhn. in Akad. Wiss. Wien Math.-Nat. Kl. **83,** 11 (1907).

Sporophores reniform, 0·2–2·0 mm. broad, horizontal, flat, white, upper surface minutely pruinose-pulverulent, under surface occupied by

3–19 round then angular shallow pores, the dissepiments pruinose on their edges ; stipe minute, lateral, white, pruinose. Spores 7–8 (–9·5) ×4·5–5·6 (–7μ), shortly ellipsoid, blue-amyloid, pruina of the surface formed of subglobose cells covered with short obtuse processes, hyaline, 16–35 × 10–20μ. Flesh compact, thin-walled, non-gelatinised hyphae, gloeocystidium-like hyphae are abundant in the dissepiments and subhymenium. Fig. 4. Densely gregarious on woody parts of monocotyledons.

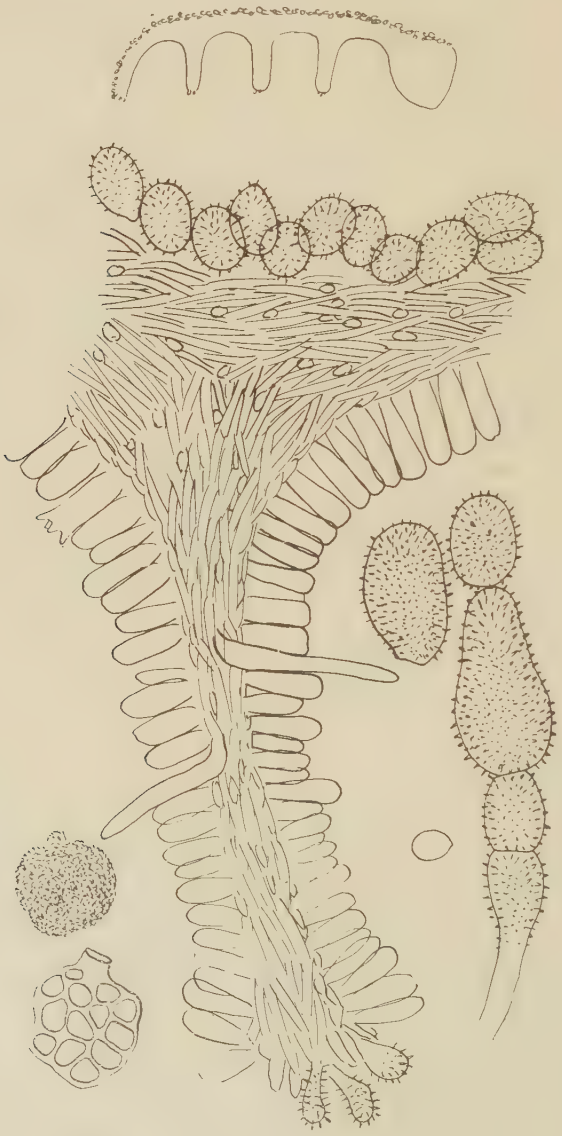


Fig. 4. *Favolaschia saccharina* Dennis 95 B. Vertical section of sporophore × 50, section of dissepiment, spherocysts of the pileus and spore × 660, upper and lower views of sporophore × 12.

Collections seen : Trinidad, on bamboo, St. Joseph 30.XI.1949, *Dennis* 95 B, det. R. Singer. The type, which I have not seen, was from Ecuador and that of *L. gemma*, studied by Singer, was from Sao Paulo, Brazil.

Favolaschia singeriana *Dennis* sp. nov.

Carpophoris albis, minimus, pseudo-stipite bene evoluto vel nullo praeditis ; superficie sterili subglabra ; poris perpaucis. Sporis (7)–7·5 8·3 × 4 4·5–5·5μ, ellipsoideis, hyalinis, amyloideis, depressione suprahilari destitutis, levibus ; basidiis 17·8–23 × 8 9μ, tetrasporis ; gloeocystidiis typicis praesentibus sed coloratione contentus haud conspicuis ; vasculis magnis hyphis alternantibus, dein fusoideo-cylindricis vel clavatis, in maturis 125 × 6·8–9·7 (15)μ ; dendrophysibus globosis vel breviter ellipsoideis, interdum pedicellatis, sporis Oudemansiella echinospermae in mentem revocantibus, 9 16μ in diametro, diverticulatione 1·7–3·5μ projiciente ornatis ; cystidiis ("dendrophysibus" levibus) similibus praesentibus ; hyphis fibuligeris. Ad rachin Pteridophyta.

Fig. 5. *Favolaschia singeriana* Dennis 95 C. Vertical section of sporophore × 50, section of dissepiment edge and three spherocysts of the pileus × 660, upper and lower views of sporophore × 12.

Venezuela : Rancho Grande, Maracay, 19.xi.1949, *Dennis* 95C (Typus). Fig. 5.

This fungus greatly resembles the preceding and following species. It differs in habit and in the peculiar behaviour of the various elements in cresyl blue mounts. The walls of the gloeo-vessels turn pink and their contents remain hyaline or lilac, not deep blue, or only very exceptionally and sparingly so. They extend only from one septum to another, alternating with ordinary narrowly filamentous hyphae in the youngest specimens, but expanding later on, and run axillarly with the dissepiments of the hymenophore ; the dendrophyses are either blackish violet in cresyl blue or "empty", i.e. with homogeneous contents not colourable in

cresyl blue. It is these empty dendrophyses that occasionally occur without diverticulation and these smooth bodies cannot be called anything but cystidia. *F. singeriana* differs from *F. pygmaea* (Speg.) Sing. in its smaller spores, stronger diverticulation of the dendrophyses, smaller carpophores, etc. The only other well known species on ferns is *F. pterigena* Sing. which differs in being brownish rather than white, in having larger spores and in the difficulty one experiences in trying to demonstrate its clamp connections.

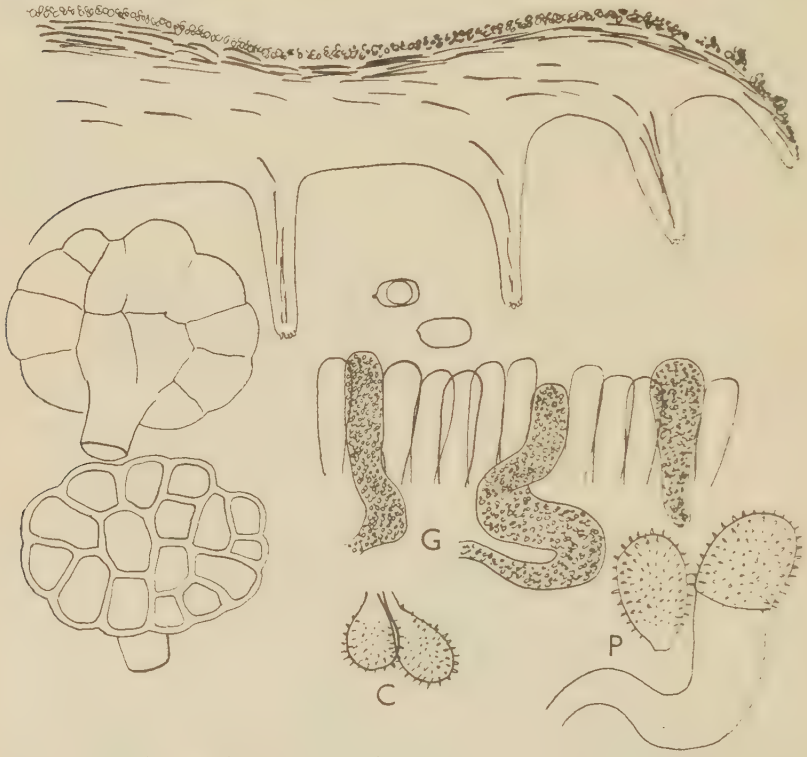


Fig. 6. *Favolaschia singeriana var.*? Dennis 95. Vertical section of sporophore × 50, black lines indicate gloeocystidium-like cells. Spores, hymenium with gloeocystidia, (G), spherocysts of pileus (P) and marginal cells of the dissepiment (C) × 660; upper and lower views of sporophore × 12.

Favolaschia singeriana var.?

This fungus is somewhat larger than the preceding, with carpophores up to 3 mm. broad, laterally pseudostipitate or centrally pseudostipitate according to their position on the substratum, pseudostipe very short and inconspicuous. The spores are also somewhat larger, ellipsoid or ovoid, 7·5–9 (9·5) × 4·3–6·3–(7) μ but the remaining anatomical characters, including the behaviour of the various elements in cresyl blue mounts, are practically identical with those of *F. singeriana*.

Collection seen : Trinidad, River Estate, Diego Martin, on fallen twigs of a dicotyledonous plant, probably *Theobroma*, 29.ix.1949, Dennis 95. Fig. 6.

Possibly this is merely an extreme form of the preceding species with variation due to the different habitat. Both may easily be confused with *F. saccharina* Pat. and *F. pygmaea* (Speg.) Sing. (=*Laschia longicellulis* Lloyd).

ON THE FLORA OF KUWEIT : II.*

B. L. Burtt and Patricia Lewis.

Caryophyllaceae (including Illecebraceae).

59. Gypsophila capillaris *Forsk. C. Chr.* in Dansk. Bot. Arkiv, 4, No. 3 : 19 (1922).

Rokejeka capillaris Forsk. Fl. Aeg. Arab. 90 & LXVI, No. 236 (1775).

Gypsophila rokejeka Del. Fl. Egypte, 87, t. 29, f. 1 (1812).

Type. Egypt, Cairo ; 1762, *Forskal* (C !).

Kuweit. Arafjan ; *esheb al dhubi* ; eaten by gazelles ; Mar. 1933, *Dickson* 111.

Distribution. Egypt, Sinai, Palestine, Syria, Iraq, Arabia, Persia.

Forskal gave a full specific description along with that for his new genus *Rokejeka* l.c. 90 , but he did not actually quote the binomial *Rokejeka capillaris*. This name he included in a list earlier on in the text (LXVI, No. 236).

Although *Gypsophila capillaris* is most often a much branched woody herb up to 24 ins. high, there are in the Kew herbarium intermediate specimens which link up with the small, comparatively little branched plant of only 5 or 6 ins. collected by Mrs. Dickson. The species is a perennial plant and the Kuweit material is of the first year's growth only.

60. Gypsophila porrigens *(L.) Boiss.* Fl. Or. 1 : 557 (1867).

Silene porrigens L. Syst. Nat. ed. 12, 3 : 230 (1768).

Saponaria porrigens (L.) L. Mant. Alt. 239 (1771).

Type. " In oriente ", *Gouan.* (Not seen. The specimen in the Linnean herbarium is marked H[ortus] U[psaliensis]).

Kuweit. Kuweit; sea level; among corn crops; a variety of Gypsophila with pale pinky mauve flowers and hairy upper stems ; 16 Apr. 1936, *Dickson* 308. Adaliyeh, 4 miles outside town ; 12 m. ; on open path in between crops of corn and barley ; height 14 ins., stem and leaves smooth at base hairy in middle and smooth at tip ; flowers pale mauve, fruits pendant on thin stalks 1 in. long ; 26 Mar. 1947, *Dickson* 541.

Distribution. Cyprus, Asia Minor, Syria, Palestine, Iraq, Persia, Afghanistan.

The Kuweit specimens give a new Arabian record for this species, and together with *Stapf* 1979 from Shirwaz in Persia also form the most southerly record. The type specimen in the Linnean herbarium consists only of the upper part of the plant ; it is about 12 ins. in height, and has a much more sparse indumentum, especially of the branches, than Mrs. Dickson's plants do.

61. Herniaria hemistemon *J. Gay* in Duchartre, Rev. Bot. 2 : 371 (1847) ; F. Hermann in Fedde, Rep. 42 : 219 (1937).

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*Continued from Kew Bull. 1949, 308.

Types. Egypt, Alexandria ; *Delile* as *Herniaria fruticosa.* Arabia, Ras Hamman ; *Schimper* 195 (not seen).

Kuweit. Arafjan ; *esh shawla* ; Mar. 1933, *Dickson* 51, 130.

Arabia. Dubai ; sea level ; desert sand, not very frequent ; low spreading growth of fern like appearance with green flowers and tough woody root ; 10 Feb. 1937, *Holmes* (*Dickson* 341 H).

Distribution. Tunisia, Libya, Egypt, Palestine, " Arabia petraea ", Arabia, S. Iraq, S. Persia.

Although the collection of Jacques Gay was bought by Sir Joseph Hooker and is now incorporated in the Kew Herbarium, no trace of the type material of this species can be found.

Two specimens from Syria, *Field* & *Lazar* 227 and 357 have been wrongly determined in the Kew herbarium as *H. hemistemon* J. Gay. With their cucullate sepals, the two inner about half the size of the outer, and four stamens opposite the sepals, they are clearly *H. arabica* Handel-Mazzetti (in Ann. K. K. Hofmus. Wien, 26 : 145. 1912) ; despite its epithet this species does not occur in the Arabian peninsula.

62. Loeflingia hispanica *L.* Sp. Pl. 35 (1753).

Type. Spain; *Loefling* (Linn!).

Kuweit. Arafjan ; Mar. 1933, *Dickson* 135.

Distribution. Spain, S. France, Sicily ; Canary Islands, Morocco to Egypt ; Iraq, Persia, India.

Mrs. Dickson's collection, which consists of only a single minute specimen, is a new record for Arabia. It is interesting to note that the only record for Iraq comes from just north of Kuweit at Zubair (*Guest, Eig* & *Zohary* 5027), while the inclusion of Persia and N.W. India in the distribution depends on two specimens, one from the Island of Kischm in the Persian Gulf, the other from Peshawar.

63. Paronychia arabica (*L.*) *Del.* Fl. Egypte, 43, t. 18 (1812) ; DC. Cat. Pl. Hort. Bot. Monsp. 130 (1813).

Illecebrum arabicum L. Mant. [prima], 51 (1767).

Type. Arabia : cult. in Horto Upsaliensi (Linn !). The material Linnaeus described was raised from seed sent by Forskal.

Kuweit. Arafjan ; *al regaiya* ; Mar. 1933, *Dickson* 46 ; 1935, *Dickson* 46A. Kuweit ; on the aerodrome ; sea level ; a creeping plant with " everlasting " dry flowers, covering about 2½ ft. of ground ; 8 Apr. 1937, *Dickson* 330.

Arabia. Jebel Amuda Mishaab ; 15–60 m. ; *al gottin* ; on slopes of hill, sandy and stony ground ; creeping " everlasting " plant with paper white flowers ; 7 Apr. 1949, *Dickson* 603.

Distribution. N. Africa, Egypt, Arabia, Palestine, Syria, Iraq, Persia (see discussion).

Casual mention of *Paronychia arabica* would probably be interpreted by most botanists interested in the flora of North Africa and the Nearer East as including such forms as *P. cossoniana* J. Gay, *P. eosina* Beauv., *P.*

desertorum Boiss. and *P. longiseta* Webb ; that is, as comprising a highly variable " species " ranging geographically from Persia in the east to Morocco in the west. It is certainly this widely distributed unit which must form the basis of a more critical investigation ; an investigation which we have tried to commence by a detailed study of the material of this group available in the Kew Herbarium. Only a few brief comments will be attempted at the moment, but it may be said straightway that we have found the materials available insufficient to allow us to reach any satisfactory taxonomic conclusions. Thus the name *P. arabica* as used here is still to be interpreted in the broad sense.

It is in assessing differences of habit that the first difficulty in dealing with the herbarium material is encountered. It is clear that plants of both annual and perennial duration do occur and perhaps three-quarters of the herbarium specimens may be readily classified as one or the other. There remains, however, a group of plants which are much larger and more woody than the typically annual forms, but show no sign of the old branches or very woody rootstocks which are characteristic of the perennials. Whether such plants are annuals which have enjoyed an exceptionally long growing season, or whether they are perennials in their first year of growth we have no data to decide. *Dickson* 330 and 603 come into this category, as does the type specimen of the species in the Linnaean herbarium.

The typically annual plants have prostrate branches a few inches long ; these grade into the plants of uncertain duration which have branches a foot or more in length. In the small plants flowering commences at the base from the original main axis and the clusters of flowers, which consist of compact irregular cymes with enlarged scarious " bracts " (stipules) are usually made up of a relatively small number of flowers. The true bracts, that is the leaves to which the branches of the inflorescence are axillary, are greatly reduced and in the upper part of the inflorescence are only represented by their stipules.

The true perennials have a compact tuft of numerous branches arising from the crown of the rootstock and from this tuft a much smaller number of longer trailing branches is developed. This habit is well shown in Delile's illustration quoted above. The bases of the shoots are clothed with closely spaced overlapping leaves and their associated scarious stipules and there is no flowering on the basal parts of these shoots. Plants showing these branches covered to the base with appressed leaves have for long been described in the literature of the group as " juniperine " ; the term is expressive and will be retained. In these perennials the cymes are more compound and the leaves are often much reduced so that the clusters of flowers are larger and more compact. The clusters are, however, more spaced out than in the smaller types where they are close together along the stems. The long trailing shoots of these perennials usually seem to be brittle, easily breaking at the nodes, and then they may warrant the description " equisetiform ".

In the leaf-shape of the *Paronychia arabica* group there is quite a range of variation, particularly with regard to the position of the widest point of the lamina along its length. A metrical study of this feature suggests that it may well be correlated with the grouping of the specimens by other

means, but the investigation has not yet proceeded far enough to justify giving detailed results.

The allied species *Paronychia argentea* Lam. has also been examined. This is usually a perennial, but Eig has noted " in the coastal plain of Palestine], especially on sandy habitats, it is an annual plant, while in the mountains it is a perennial one " (Flora Palaestinae Exsiccata, no. 44). *P. argentea* has broader leaves than *P. arabica* ; the large papery "bracts" are at least twice the length of the flowers (they are 1½ times or less in *P. arabica*) ; and the calyx has stiff straight hairs over the outer surface, in contrast to the hooked hairs found at the base and sometimes up the centre of the sepals in the *P. arabica* group. The nearest approach to *P. argentea* is *P. eosina* Beauv. (*P. arabica* var. *tripolitana* Dur. & Barr.) which has inflorescences and large " bracts " very like those of *P. argentea*, but the calyx indumentum of *P. arabica*.

The type specimen of *P. arabica* in the Linnean herbarium is rather incomplete, so that it is difficult to form a real picture of the plant Linnaeus described. There is no root present, but the lowest branch is almost juniperine and flowering is mostly in the upper part of the shoot. The flowers themselves are very small, only 3·5–4 mm. across, and they appear to be very similar to those of a plant collected at Wadi Tumilat in Egypt (*Schweinfurth* 77). This specimen was regarded as typical *P. arabica* by Ascherson (in Oesterr. Bot. Zeitschr. 39 : 324. 1889) ; it has long fine branches spreading to a length of about 12 inches from the *apparently* annual root. Flowering commences from the base and the leaves are small and oblanceolate. Several other collections from Egypt (e.g. *Kotschy* 494, with branches 5 ins. long) are similar to Schweinfurth's plant and clearly belong to the same species.

The two forms usually found under the name *P. desertorum* Boiss. and *P. cossoniana* J. Gay are both perennial with juniperine basal growth. The former has small flowers, the sepals having a narrow thickened midrib, and it is found in Egypt and the countries to the east ; the latter has larger flowers, the sepals having a thickened midrib nearly as broad as the wings, and is found in the countries west of Egypt. As already mentioned Delile's illustration under the name *P. arabica* is of a perennial plant : it agrees closely with Boissier's *P. desertorum*.

There are other named forms in this group (e.g. *P. arabica* var. *macrathera* Maire, which has very strongly hooded sepals with a stout mucro about ⅓ their length) but material of them is at present too limited to allow their full value to be assessed.

Among Mrs. Dickson's collection *Dickson* 46 and 46A represent small annual plants only a few inches across. The leaves are linear and the flower-clusters small, each containing only three or four flowers. As in other evident annuals there is no juniperine growth and flowering commences low down on the original main axis. The flowers themselves are 5 mm. across and of the usual *P. arabica* type with two inner narrow and strongly hooded sepals and three outer ones, very broad and less hooded ; the central thickened midrib of the sepals is narrower and the wings broader than in many of the other specimens examined : the mucro, 0·5 mm. long, is about a quarter the length of the sepal : the hooked hairs characteristic of the species are found only at the base of the

sepal the upper part having a few short straight hairs. Apart from their small size these plants agree fairly well with the type specimen of *P. arabica* in the Linnean herbarium.

Dickson 603 is a larger plant with flower-clusters exceeding those of the type specimen in size, but it is only a link to the even stouter plant represented by *Dickson* 330, which has elongate flower-clusters up to 2 cm. long and containing 20 or more flowers. Unfortunately both the specimens lack the basal portion and we cannot tell whether they be annuals or perennials. It is worth mentioning that two specimens collected by *Field & Lazar* (No. 102 from Iraq and No. 207 from Syria) both have tufted juniperine growth from a perennial stock ; the trailing branches are less than 6 inches long, but otherwise are similar to those of *Dickson* 330.

There is little difference in the leaves of *Dickson* 330 and *Dickson* 46 and 46A, while the flowers of the former differ only in having hooked hairs up the midrib of the sepal as well as at the base and in a shorter mucro. It may be that Mrs. Dickson's specimens represent a parallel to the annual and perennial forms of *P. argentea* mentioned by Eig.

To sum up the general taxonomic position in this group, further material is needed to elucidate the duration of the different forms and there is scope for careful investigation in the field to clear up the questions whether the same species may be an annual or perennial according to conditions and whether the perennial forms do actually flower during their first season. Furthermore good samples of about 25 specimens, each collected at random from populations in various parts of the geographical range of the group, are needed before a critical estimation of the value of such floral characters as length of mucro and width of sepal midrib and of vegetative characters such as leaf shape can be made.

Over and above the botanical problems of this group one point of nomenclature must be clarified. Mention has been made that the perennial plant with tufted juniperine growth (as illustrated by Delile) corresponds to *P. desertorum* Boiss. Ascherson (in Osterr. Bot. Zeitschr. 39 : 300. 1889) has replaced this name by *P. lenticulata* (Forsk.) Aschers. & Schweinf., based on " *Herniaria lenticulata* Forsk." This action cannot be maintained in modern nomenclature. Forskal did not describe a species *Herniaria lenticulata* : he identified (Fl. Aeg.–Arab. 52 : 1775) a plant collected by himself as *Herniaria lenticulata* L. (Sp. Pl. 1 : 218. 1753). Admittedly Forskal does not explicitly cite Linnaeus, but nor does he give such citations for any other of the numerous Linnean species which he mentions. The coincidence of the generic and specific names is too great to admit of any other interpretation and, furthermore, the name is not followed by a brief italicized definition which is the general (but by no means invariable) rule where Forskal's new names are proposed. In any case had " *H. lenticulata* Forsk." been intended as a new species the position would remain unchanged for it would, of course, be a later homonym of *H. lenticulata* L. and therefore an illegitimate name and not available as the basis for any later combination.

As to the identity of Linnaeus's species, the specimens in his own herbarium have long been known to belong to *Cressa cretica* L. (*Convolvulaceae*) ; they are not, however, the type of the species. Linnaeus supplied no definition or description of *Herniaria lenticulata* but merely

referred to " *Polygonum minus lentifolium* Bauh. prodr. 131 " which is the *Polygonum minus tenuifolium* of Bauhin's Pinax (p. 281). In a note Linnaeus mentions that the species has " Habitus proximus herniariae sed mollissimus " and the last word rather suggests that he was in fact looking at the softly hairy *Cressa cretica* when he wrote it. Nevertheless Bauhin's specimens are clearly the basis of the species. Specimens, in the plural, because Bauhin recorded the species (and in this he is copied almost verbatim by Linnaeus) from the mountains of Escorial in Spain and from near Montpellier. Only the Montpellier specimen is present in Bauhin's herbarium and this De Candolle identifies as a *Corrigiola* (see Bull.Herb. Boiss. 2 Sér. 4 : 727. 1903). It is clear, however, that Bauhin's description is based mainly on the Spanish plant which had been sent to him by one Albinus. Colmeiro (Pl. Hisp. Lusit. 1 : p. CXIV. 1885) tells us that this Albinus [Albino] was a doctor of Hamburg who sent several plants to Bauhin and the latter described them in his Prodromus. We have no knowledge of where Albinus's specimen of *Polygonum minus lentifolium* may be as it is not in the Bauhin herbarium and are thus forced back on Bauhin's description for the determination of this species : it has long been regarded as probably referring to *Herniaria incana* Lam., but we think it will be agreed that this determination is not sufficiently secure to justify taking up the earlier name *Herniaria lenticulata* for that plant. One further point may be mentioned ; Colmeiro (l.c. 2 : 431. 1886) cites under *Herniaria incana* Lam. " *H. lenticulata* L. excl. synon. ; *Polygonum minus lentifolium* C. Bauh." From what has been said these statements appear contradictory, for *P. minus lentifolium* is the one sysnonym on which *H. lenticulata* is based. But Colmeiro says " excl. synon." because he was almost certainly referring not to the first edition of Species Plantarum but to a later work (e.g. Linn. Sp. Pl. ed. 2, 1 : 315. 1762) where a considerable accretion of synonymy had been added to the original citation.

Finally, to return to the name " *Paronychia lenticulata* (Forsk.) Aschers. & Schweinf." it seems preferable to regard this as a misguided new combination based on *Herniaria lenticulata* L. rather than as a new name *Paronychia lenticulata* Aschers. & Schweinf. based on Forskal's description.

64. Polycarpaea repens (*Forsk.*) *Aschers. & Schweinf.* in Oesterr. Bot. Zeitschr. 39 : 126 (1889).

Corrigiola repens Forsk. Fl. Aeg.–Arab. 207 (1775).

Polycarpaea fragilis Del. Fl. Egypte, 65, t. 24, f. 1 (1812).

Type. Egypt : Cairo, in the desert ; 1762, *Forskal* (C !).

Kuweit. Arafjan ; Mar. 1933, *Dickson* 11, 73 ; 1935, *Dickson* 73 A.

Arabia. 10 km. N. of Jubail (Eastern Arabia) ; 6 m. ; together with 461 [*Lotus garcini* DC.] among heavy sand and clumps of *hamat* (*Lithospermum*) a straggling plant not yet in bloom ; 28 Mar. 1942, *Dickson* 462. Dahna Plain ; from the almost barren plains between the sand ridges ; 27 & 28 Feb. 1865, *Pelly*. Bahrein Island ; northern slope of Jebel Dukhan which is being covered over by wind blown sand ; flat on ground ; 17 Mar. 1936, *Fernandez* 562, 569.

Distribution. Algeria, Tunis, Egypt, Sinai, " Arabia petraea ", Palestine, Arabia.

65. Polycarpon tetraphyllum (*L.*) *L.* Syst. Nat. ed. 10, 881 (1759).

Mollugo tetraphylla L. Sp. Pl. 89 (1753).

Type. Specimen in Herb. Clifford labelled *Herniaria alsines folio* (BM !).

Kuweit. Failaka Island ; sandy soil and in corn crops ; a prostrate plant with dense clusters of small greenish flowers ; 24 March, 1936, *Dickson* 299.

Distribution. All countries around the Mediterrean ; introduced to many parts of the world.

66. Pteranthus dichotomus *Forsk.* Fl. Aeg.–Arab. 36 & LXII, No. 100 (1775).

P. echinatus Desf. Fl. Atl. 1 : 144 (1798).

Type. Cairo, in the desert ; *Forskal* (C—not seen).

Kuweit. Arafjan ; Mar. 1933, *Dickson* 129 ; 1935, *Dickson* 129 A. Arafjan ; on sandy soil ; 1936, *Dickson* 129 B. Failaka Island ; sea level ; on fallow ground and in amongst corn crops ; bushy green plant with dense clusters of pinkish green flowers ; 22 Mar. 1938, *Dickson* 418.

Distribution. Algeria, Tunis, Libya, Cyprus, Egypt, Sinai, Palestine, Arabia, Iraq, Persia, Baluchistan.

Forskal (l.c. 36) gave a full generic description for *Pteranthus* but did not mention any actual species on that page. He did however give the binomial *Pteranthus dichotomus* in a list of Egyptian plants (l.c. LXII, No. 100) with an indication that the plant had been described.

There seems to have been some difference of opinion as to the structure of the inflorescence of *Pteranthus* ; it has been wrongly described by Post (Fl. Syr. Pal. Sin. 164 : 1896) as being a " three branched cyme, the central branch one-flowered, the lateral pinnatipartite, sterile " ; Murbeck (Beitr. Biol. Wüstenpfl. 2 : 33 in Lunds Univ. Arsskr. N.F. Adv. 2 Bd 17 Nr. 1 1920) correctly refers to it as a usually three-flowered dichasium, with the tertiary branches sterile and spiny, the spines being reduced leaves, and he points out that sometimes there is a fourth flower arising as one of these axes of the third series.

From the illustration taken from material of *Dickson* 418 it will be seen that the inflorescence consists of a three-flowered cyme. The broad leaf-like peduncle (Fig. 3A) bears at its tip a central sessile flower and on either side a membranous bract consisting of enlarged stipules fused over a much reduced leaf. In the axil of each bract is another sessile flower (Fig. 3B) and again on either side, but in the opposite plane, there is membranous bract, this time subtending a short sterile branch with small reduced leaves. These bracts are also made up of enlarged stipules with reduced leaf blade, but the stipules do not fuse over the top of the leaf which becomes somewhat spine-like and is hooked at the tip. The sterile branches may be simple or once branched in which case there is another pair of bracts subtending the branches (Fig. 3 C). The small reduced leaves on the branches are arranged in opposite pairs ; they are each hooked at the tip while the lower ones often have small membranous stipules. The central flower (Fig. 3 D) is symmetrical consisting of two outer winged sepals, in opposite plane to the flattened peduncle, and two

inner smaller sepals. The lateral flowers Fig. 3 E, are asymmetrical with only one outer winged sepal borne on the outer side of the inflorescence and in the same plane as the flattened peduncle ; the other outer sepal is much reduced, and the inner sepals are not at all winged.

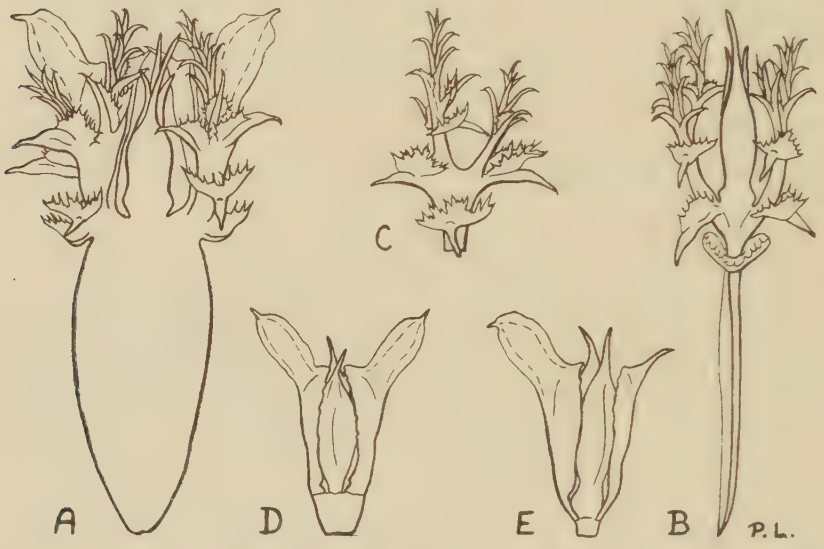

Fig. 3. *Pteranthus dichotomus* Forsk. A. Leaf-like peduncle with three-flowered cyme. B. Lateral view of same. C. Sterile branch. D. Central flower. E. Lateral flower. All × 6.

Two plants from Cyprus have a slightly more complex inflorescence than that of *Dickson* 418 (Fig. 4A). In *Kennedy* 1614 (Fig. 4 B) one of the secondary bracts subtends a fourth flower which has another pair of bracts on either side of it, and a sterile branch in the axil of the outer one. This fourth flower is more or less symmetrical with all the sepals winged, in fact the sepals of all the flowers are more winged than in *Dickson* 418. *Haradjian* 137 (Fig. 4 C) is still more complex in having a further pair of bracts on either side of the fourth flower, which changes the orientation of the sepals. In both these specimens from Cyprus it appears that only one branch of the cyme becomes compound.

Both the flattened peduncle and the branches of the cyme itself are papillose hairy in all the specimens seen. All the flowers in the material examined have both stamens and an ovary with a single ovule, and appear to set seeds. The whole inflorescence, including the wing-like peduncle, falls from the parent plant and serves as the disseminule : the individual seeds are not separately dispersed. Generally only one of them, formed from one of the secondary flowers, germinates to produce a new plant. Occasionally, as seen in *Syngrassides* 1795 from Cyprus, when the inflorescence falls two new plants arise, one on either side from the secondary flowers. Whether there is any differential ability to germinate between the seeds formed from the primary and secondary flowers is not known. It is hoped to obtain material to investigate this.

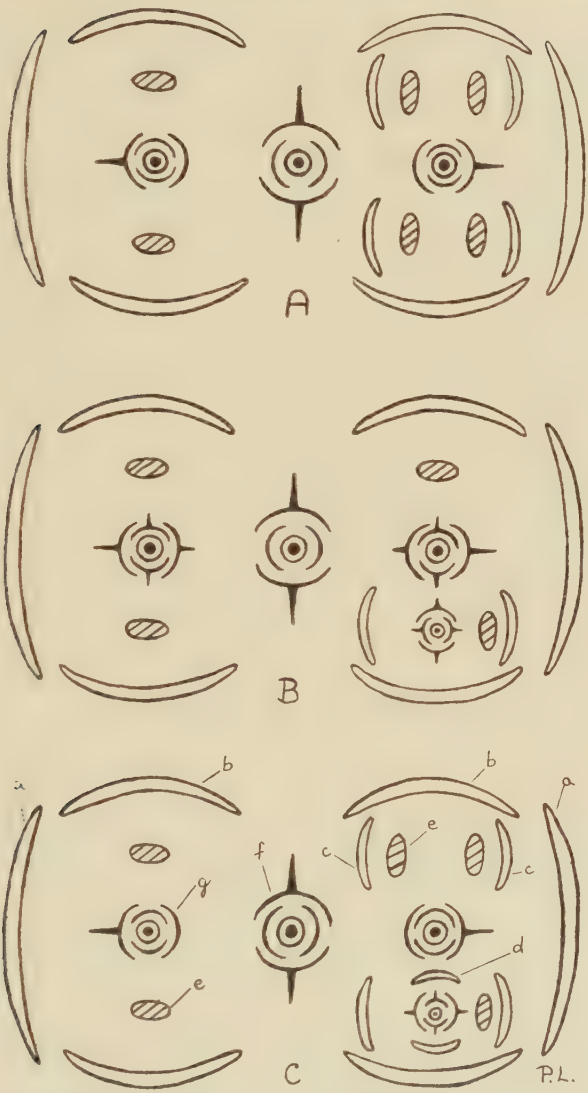

Fig. 4. *Pteranthus dichotomus* Forsk. A, B & C. Diagrammatic representation of various arrangements of the inflorescence. a, b, c, d—pairs of bracts. e—sterile branches. f—central flower. g—lateral flowers.

67. Robbairea delileana *Milne-Redhead* in Kew Bull. 1948 : 452 (1949) ; 1950 : 340 (1950).

Type. Egypt, Birket el-Hâggy ; sandy plains ; *Delile* (P—not seen).

Kuweit. Arafjan; Mar. 1933, *Dickson* 64; 1935, *Dickson* 64A.

Distribution. Egypt, Sinai, Palestine, Iraq, Arabia, Sudan, Somaliland.

The plant Delile (Fl. Egypte 246. tab 24. f. 2. 1812) incorrectly described under the name *Alsine prostrata* Forsk. is the type of this species. *Robbairea prostrata* of Boissier (Fl. Or. 1 : 135. 1867) is also this species, but Boissier was in error in identifying it with *Alsine prostrata* Forsk. (For a full account see Milne-Redhead l.c.).

68. Saponaria vaccaria *L.* Sp. Pl. 409 (1753).

S. segetalis Neck. Delic. Gallo-Belg. 194 (1768), *nomen illegitimum.*

Vaccaria pyramidata Medik. Phil. Bot. 1 : 96 (1789) ; Jahand. & Maire, Cat. Pl. Maroc. 2 : 236 (1932).

V. segetalis (Neck.) Garcke in Aschers. Fl. Brand. 1 : 84 (1864) ; Post, Fl. Syr. Palest. & Sinai, ed. Dins. 1 : 162 (1932), *nomen illegitimum.*

Type. Specimen in the Herb. Clifford labelled *Lychnis segetum flore rubra perfoliata* (BM !).

Kuweit. Kuweit ; *al dehdihan* ; rare ; late Mar. 1933, *Dickson* 119 ; 1935, *Dickson* 119 A. Failaka Island ; 24 Mar. 1936, *Dickson* 119 B.

Distribution. From the Canary Islands, across Europe and North Africa to Tibet and China. Introduced into the British Isles, America and Australia.

Dickson 119 and 119 B approach var. *grandiflora* Fisch. (in DC. Prodr. 1 : 365. 1824) but is not possible to give such a determination in the case of *Dickson* 119 A as the specimen is in fruit. In *S. vaccaria* var. *grandiflora* the petals have a long exserted claw so that the whole corolla is nearly twice the length of the calyx, while in typical *S. vaccaria* the claw is scarcely longer than the calyx and the whole corolla is only 1½ times its length, as seen in the Hortus Cliffortianus specimen.

69. Sclerocephalus arabicus *Boiss.* Diagn. 1 Sér. 3 : 12 (1843) ; Fl. Or. 1 : 748 (1867).

Type. Arabia, Muscat ; *Aucher-Eloy* 4153 (G, K !—provisional lectotype).

Kuweit. Arafjan ; *al thraisa* ; Mar. 1933, *Dickson* 28. Failaka Island ; sea level ; amongst corn and in fallow ground, common ; plants with circular thorny heads which afterwards turn into dry hard thorny seeds ; 22 Mar. 1938, *Dickson* 416.

Arabia. West of Abu Hadriych ; 90 m. ; sandy ground among *hamdh* bushes ; small green plant 3 ins. high with hard thorny heads ; 7 Apr. 1949, *Dickson* 579.

Distribution. Cape Verde Island, Canaries, Morocco, Algeria, Egypt, Nubia, Sinai, Palestine, Arabia, Persia.

Aucher-Eloy 4153, of which there is a duplicate in the Kew herbarium, is chosen as the provisional lectotype, because it is the specimen on which Boissier's description of both the genus and the species is based. Under the species he cites the synonym *Paronychia sclerocephalus* Decne. and the Bové specimen which was its type, but he clearly did not see this and it seems desirable to take as the type of *Sclerocephalus arabicus* the specimen with which he actually worked.

70. Silene arabica *Boiss.* Fl. Or. 1 : 593 (1867).

S. affinis Boiss. Diagn. 2 Sér. 1 : 72 (1856) ; Rohrbach, Monogr. Gatt. Silene, 104 (1868) ; non *S. affinis* Godr. Fl. Juv. ed. 1. 60 (1854).

Type. Sinai ; 16 Apr. 1835, *Schimper* 411 (G, K !).

Kuweit. Arafjan ; *um jeras* ; Mar. 1933, *Dickson* 34 ; 1935, *Dickson*

34 A. Failaka Island ; 24 Mar. 1936, *Dickson* 34 B. Adaliyeh ; sea level ; amongst corn crops ; a variety of campion with white flowers ; 7 Apr. 1935, *Dickson* 212. Masjan Island ; sea level ; a small white flowered campion ; 21 Mar. 1938, *Dickson* 445.

Arabia. On road to Hofuf, S.W. of Abqek oil field ; sandy ground ; plant 7 ins. high, flowers white, slightly sticky leaves ; eaten by sheep, goats and camels ; 23 Mar. 1947, *Dickson* 531. Wadi Arar ; 450 m. ; *lassaige* ; in the wadi in red sandy gravel soil ; campion 5 ins. high with white flowers in bloom at 9 a.m. ; 18 Apr 1950, *Dickson* 666.

Distribution. Sinai.

Previously this species has only been represented in the Kew Herbarium, by the type specimen and *Schimper* 72, also from Sinai. Mrs. Dickson's specimens therefore extend the record of distribution considerably further eastwards and southwards.

In general habit this species is very similar to small plants of *S. oliveriana* Otth, but it can be distinguished chiefly on the indumentum and seed characters. *S. arabica* has glandular hairs over the surface of stems, leaves and calyx and the seeds are 0·5–0·75 mm. across with ear shaped depressions laterally and an obtuse groove dorsally ; *S. oliveriana* is adpressed and shortly pubescent while the seeds are 1·1·25 mm. across with concave lateral surfaces and an acute depression formed between the two dorsal wavy wings.

71. Silene conoidea *L.* Sp. Pl. 418 (1753) ; Rohrbach, Monogr. Gatt. Silene, 92 (1868).

Type. Cult. in Horto Upsaliensi (Linn !).

Kuweit. Adaliyeh–Kuweit ; sea-level ; amongst corn crops ; a bright pink flowered campion ; most plants had already gone to seed when found ; 7 Apr. 1935, *Dickson* 193. Same locality ; a campion with pink flowers ; 1 Mar. 1937, *Dickson* 325.

Distribution. Spain, S. France, Italy. From Asia Minor and Libya, through N.W. India to N. China.

The closely allied species *S. conica* L. sometimes confused with *S. conoidea*, is easily distinguished in the fruiting stage by the shape of the capsule, which is ovate conic in the former and globose with a long beak in the latter. Rohrbach separates the two species on the pubescent filaments of *S. conica* in contrast to the glabrous ones of *S. conoidea*, but from the material studied at Kew it has been found that both species have the filaments pubescent at the base and glabrous above, although the degree of pubescence does seem to be greater in *S. conica*.

Usually the leaves of *S. conoidea* vary in size from 45 mm. × 5 mm. to 60 mm. × 9 mm. (as seen in Mrs. Dickson's material), but in some specimens including the type the leaves become much broader (50 mm. 12 mm.).

72. Silene oliveriana *Otth* in DC. Prod. 1 : 373 (1824) ; Boiss. Fl. Or. 1 : 597 (1867).

S. colorata Poir. subsp. *oliveriana* (Otth) Rohrbach, Monogr. Gatt. Silene 116 (1868).

Type. Circa Aleppo & Mossul ; *Olivier* (G—not seen).

Arabia. Wadi Badanah ; 450 m. ; in valleys between low hills ; campion 10 ins. high, flowers closed at 4 p.m. but appeared to be creamy white or yellow ; 17 Apr. 1950, *Dickson* 682.

Distribution. Syria, Palestine, Transjordan, Iraq, Persia.

Although *S. oliveriana* is very close to *S. colorata* Poir. it is distinct in the form of the leaves, which are lanceolate or linear-acute but not spathulate, while the capsule which is up to twice the length of the carpophore in *S. colorata* is here of about equal length. It seems desirable therefore that these two plants should be retained as separate species, which is in accordance with Boissier's treatment. The Arabian material has very narrow acute leaves, shortly pubescent over the surface and ciliate at the base.

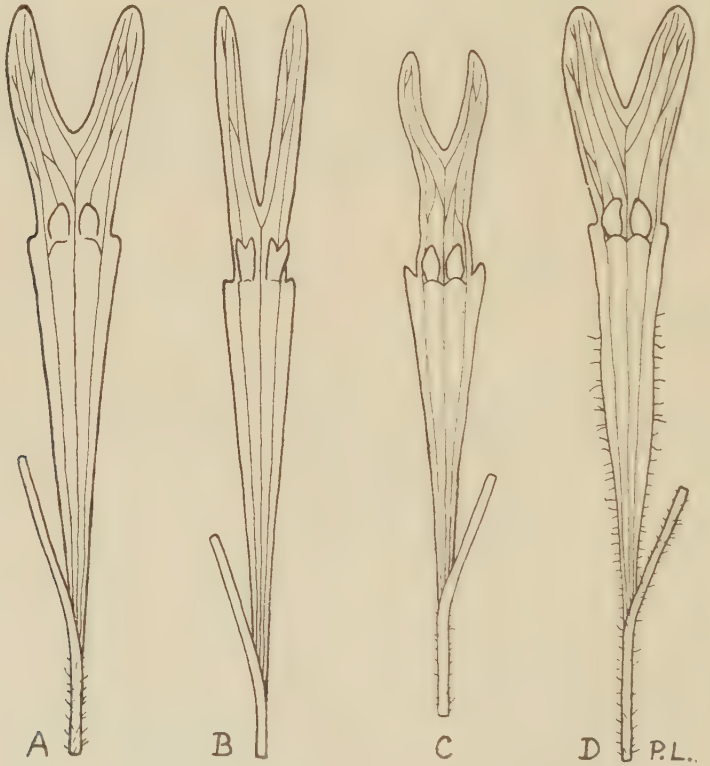

Fig. 5. Petal variation in *Silene*. A. *S. salsa* Boiss. ; B. *S. linearis* Decne. ; C. *S. leyseroides* Boiss. ; D. *S. kotschyi* Boiss. All × 6.

73. Silene salsa *Boiss.* Diagn. 1 Sér. 8 : 77 (1849).

Type. Persia. Lake Nemek–Derja, near Schiras ; 1 Jun. 1842, *Kotschy* 453 (G, K !).

Kuweit. Failaka Island ; sea level ; amongst crops ; a fine leaved campion with pale pinky white flowers, the five petals divided at the tips, and sticky stems ; 24 Mar. 1936, *Dickson* 289. Maskan Island, 18 miles S.W. of Kuweit ; 15 m. ; on western tip of island growing among

Shinan bushes with Sama grass ; campion with pale pinky mauve merging to white flowers and sticky stem ; 8 May 1942, *Dickson* 492.

Distribution. Iraq, Persia.

S. salsa, generally considered as synonymous with *S. leyseroides* Boiss., is here given tentative recognition as a distinct species. The fragmentary nature of the herbarium material however makes it difficult to form a precise idea of the species or of its allies.

Kotschy 453 which is in the early fruiting stage is very close to *S. leyseroides*. It does however seem to differ in the form of the petal which are broader, and in the corona lobes which are broader and more rounded at the tip : Boissier in his original description gave no indication of the form of these scales. Mrs. Dickson's plant 289 which is low and decumbent, reaching to about 6 ins. in height, shows the petals with the lamina and claw well developed (Fig. 5 A), and in this approaches very close to *S. kotschyi* except for the variation in pubescence. The capsule however is ovate-oblong, equal to the carpophore and reaches to the top of the calyx or slightly beyond it, agreeing thus with *S. salsa* rather than *S. kotschyi*.

The following notes summarize some of the available data obtained from the material of the other allied species in the Kew herbarium and may be of help in future investigations. Field data on the constancy of the characters mentioned (e.g. shape of coronal scales, division of petal lamina) is badly needed.

1. *S. linearis* Decne. Ann. Sci. Nat. 2 Sér. 3 : 276 (1835).

Type. Sinai ; *Bové* 178 (P—not seen).

Distribution. Sinai, Arabia.

The type specimen of this plant has not been seen, but from the material available including a plant cultivated from seed of *Schimper* 222, Arabia petraea the chief distinguishing characters of the species have been obtained. It is an erect plant up to 18 ins. high with the lower leaves lanceolate, the upper becoming narrower. The calyx which may be glabrous or shortly pubescent with triangular acute teeth, ciliate and membranous around the margins, and the capsule which is ovate oblong and equal to the carpophore, show very close resemblance to Mrs. Dickson's plant. The white corolla however is quite distinctive, the petals being deeply divided almost to the base of the lamina into two linear lobes, while the lobes of the corona are denticulate (Fig. 5 B).

2. *S. chaetodonta* Boiss. Diagn. 1 Sér. 1 : 39 (1842).

Type. Persia ; *Aucher-Eloy* 4223 (G, K !).

Distribution. Asia Minor, Iraq, Persia.

The type specimen is in fruit and has fine attenuate calyx teeth about half the length of the tube, while the capsule is ovate and longer than the carpophore. Other specimens from Persia (e.g. *Stapf* 299) show that the petals are pink, divided to the middle of the lamina and have linear acute corona lobes.

3. *S. kotschyi* Boiss. Diagn. 1 Sér. 1 : 40 (1842) ; Boiss. Fl. Or. 1 : 602 (1867).

Type. Asia Minor, Taurus Mts. ; 1836, *Kotschy* 85 (G, K !—provisional lectotype).

Distribution. S.E. Asia Minor, Syria.

Boissier also cites *Aucher* 425 from Aintab under the original description. From these two specimens this species can be said to have a papillose hairy calyx with lanceolate acuminate teeth a third the length of the tube, and ciliate but not membranous at the margins. The corolla is pink with the lamina of the petals divided to the middle and the lobes of the corona rounded at the tip (Fig. 5 D) ; the petal claw even above the base of the ovary and also the lower half of the filaments are ciliate. The capsule is ovate, somewhat exserted from the calyx and longer than the carpophore.

4. *S. microsperma* Fenzl, Pug. 9 (1842) ; Rohrbach, Monogr. Gatt. Silene 163 (1868).

Type. Syria near Svedie ; *Kotschy* (Vienna—not seen).

This name has been used by Rohrbach as the correct one for *S. kotschyi* Boiss., and although we have noted that they were both published in the same year we prefer not to take up *S. microsperma* as the type specimen has not been seen by us, and there is some doubt as to whether it may be the same plant ; in the description given by Rohrbach the petal claw is said to be glabrous and not ciliate as seen in *Kotschy* 85.

5. *S. leyseroides* Boiss. Diagn. 1 Sér. 1 : 41 (1842).

Type. Iraq, Babylon ; *Aucher-Eloy* 448 (G, K !).

Distribution. Iraq, Afghanistan, Baluchistan, N.W. India.

This plant is erect, up to 12 ins. in height and has the calyx glabrous to pubescent with lanceolate acute teeth, ciliate and membranous on the margins. The corolla is pink rarely white, with the lamina of the petals narrow and divided barely to the middle. The lobes of the corona are rather small and narrow and although pointed at the tip are obtusely so. (Fig. 5 C). The filament and petal claw are pubescent below the ovary. The capsule is oblong, equal to the carpophore and reaches to the top of the calyx.

6. *S. arenosa* C. Koch in Linnaea, 15 : 711 (1841) ; Rohrbach, Monogr. Gatt. Silene 161 (1868).

Type. Araxa ; *Koch* (B ?—not seen).

Rohrbach takes up this name in preference to Boissier's *S. leyseroides* as it is the earlier. We have not seen the type and are therefore doubtful if it is indeed the same plant, as Koch in his description says that the petal has a short bifid lamina and a long claw, but that it is *ecoronate*. Rohrbach in his key points out that the petal claw and filament are glabrous, whereas in the type of *S. leyseroides* it has been noted above that they are pubescent.

74. Silene villosa *Forsk.* Fl. Aeg. Arab. 88 (1775) ; Boiss. Fl. Or. 1 : 592 (1867) ; Rohrbach, Monogr. Gatt. Silene 110 (1868).

S. canopica Spreng. Syst. Veg. 2 : 406 (1825).

Type. Egypt, prope Pyramides Gizenses, ad agrorum margines ; fine Jan. 1762, *Forskal* (C !).

KUWEIT. Shab, 5 miles S. of Kuweit ; Mar. 1933, *Dickson* 30 ; 1935, *Dickson* 30 A.

ARABIA. Ras Tannura, N. of Qatif ; sea level ; *turba* ; sandy ground not far from sea, also along coast near Damman ; flower white, slightly scented, plant 2 or 3 ins. high only ; 3 Apr. 1942, *Dickson* 488. On road to Hofuf S.W. of Abqek oil field ; *turba* ; sandy ground with numbers 529–531 [*Matthiola arabica* Boiss., *Cakile arabica* Velen. et Bornm., *Silene arabica* Boiss.] ; dwarf campion with white flowers ; 23 Mar. 1947, *Dickson* 532. Tapline road, W. of Jubail ; 90 m. ; sandy ground ; white campion ; 7 Apr. 1949, *Dickson* 584. About 75 miles E.N.E. of Riyadh ; hollows amongst sand hills, abundant ; 11 Mar. 1865, *Pelly*.

Distribution. Algeria, Egypt, Sinai, Arabia, S.W. Persia.

S. villosa varies from being a small unbranched plant 2 ins. high to a much branched decumbent and spreading leafy one of 8 or 9 ins. The type material is not greatly branched but some of its branches spread to 9 ins. while all the above material from Kuweit and Arabia is of small plants with but few branches.

S. villosa has been confused both in morphology and nomenclature with some of its close allies and investigation has shown, for reasons given below, that the correct names of these allied species should be *S. biappendiculata* Rohrb., *S. ligulata* Viv. and *S. setacea* Viv. The four species involved, which are linked in having flowers in a one-sided raceme and the apex of the calyx not contracted in fruit, can be distinguished on the following characters :—

Plant glandular-pilose ; carpophore glabrous or with minute indumentum ; seeds 0·5–0·75 mm. across, minutely rugose with flat lateral surfaces and obtusely grooved dorsally ; calyx 15–25 mm. long with teeth obtuse 2·5–3 mm. long ; petal lamina divided about ½ of its length into two obovate obtuse lobes each 3·5–4 mm. across, corona 2 mm. long, 0·75 mm. across, ligulate with serrate upper margin.

S. villosa Forsk.

Plant pubescent but not viscous ; carpophore with distinct indumentum ; seeds smooth or striate with concave lateral surfaces.

Seeds 1·25–1·5 mm. across, smooth, with concave lateral surfaces and acutely grooved dorsally (bicarinate) ; capsule broadly ovate, equal to or shorter than carpophore ; petal lobes ligulate, corona 1 mm. long and 0·5 mm. wide, obtuse.

S. biappendiculata Rohrb.

Seeds 0·5–1 mm. across, faintly striate, with ear-shaped depressions laterally and obtusely grooved on the dorsal surface ; capsule narrowly ovate, longer than carpophore.

Leaves oblong to oblanceolate ; calyx 12–13 mm. long, spreading pubescent, teeth 1·5–2 mm. long, obtuse to broadly acute ; petal lamina divided about ⅔ of length into two oblong obtuse lobes, corona 2 mm. long, 0·75 mm. wide, obliquely acute.

S. ligulata Viv.

Leaves linear-setaceous acute, margins inrolled ; calyx 12–15 mm. long, appressed pubescent with teeth 2·5–3·5 mm. long, lanceolate acute ; petal lamina divided almost to base into two linear lobes, corona 0·5 mm. long and 0·5 mm. wide, obtuse.
S. setacea Viv.

With regard to the nomenclature, the epithet *canopica* has caused the most confusion in the history of these species. It was first used by Delile (Fl. aegypt. illust. 62, no. 442. 1812) but was not validated by a description (cf. note under no. 49 ; Kew Bull. 1949, p. 302) and is therefore only a *nomen nudum*. Delile's plant collected at Alexandria is in the Kew herbarium ; it is pubescent but not viscous and has a pubescent carpophore, while the petals are narrow the lobes of the lamina being 0·5 mm. or less in width. The calyx teeth are lanceolate acute becoming very broad at the base in the fruiting stage ; they are ciliate margined and generally glabrous, although the tube is often pubescent along the veins. The capsule is broadly ovate, shorter than the carpophore, while the seeds are smooth, concave laterally and bicarinate dorsally.

Sprengel was the first to validate the epithet *canopica* : he described it as a viscous plant from Upper Egypt. Although he cites no collector he probably had before him the plant collected by *Sieber* from Tentyra (Denderah). He correctly described it as glandular-pilose and viscous and the specimen at Kew has a nearly glabrous carpophore. *S. canopica* Spreng. is clearly a synonym of *S. villosa* Forsk.

Lastly Boissier used the epithet *canopica* giving *Samaritani* 2999 from Alexandria as the type and only specimen. This plant is densely pubescent but not viscous, the calyx has spreading hairs evenly distributed, while the lobes of the petals are 1 mm. across. The carpophore is pubescent and the capsule is narrowly ovate, longer than the carpophore ; the seeds are finely striate, with ear-shaped depressions laterally and an obtuse groove dorsally.

The earliest valid name for the species *S. canopica* Del. appears to be *S. biappendiculata* Rohrb., although Rohrbach himself included *S. canopica* Del. under *S. villosa* ! We have not seen the type specimen of *S. biappendiculata*, but there is in the Kew herbarium a fragment of material collected by Ehrenberg at Damietta which may be part of the type collection. This plant is finely pubescent and has a glabrous calyx with ciliate margins to the lanceolate acute teeth. The lamina lobes of the petals are ligulate 0·5 mm. wide, the corona being 0·75 mm. long and 0·5 mm. wide ; there is no fruiting material on this specimen. From Rohrbach's description it is apparent that he was describing the larger seeded plant, which has the short capsule and narrow lamina lobes to the petals. His first variety of *S. biappendiculata* with the synonym *S. ptolemaica* Ehrenb. herb. is represented by a specimen in the Kew herbarium, which agrees very well with Delile's plant. It therefore seems almost certain that the correct name for this species is *S. biappendiculata*.

As a second variety Rohrbach included the synonym *S. canopica* Boiss., pointing out that the plant had a much more dense indumentum and broader leaves. It is noted above however that there are a number of other differences in flower, fruit and seed characters. The material sorted with *Samaritani* 2999 also includes the *Ehrenberg* specimens from

Alexandria which Rohrbach named *S. ligulata* Viv. We have not seen the type specimen of *S. ligulata*, but Viviani's original description and illustration do appear in general terms, to agree with the material available for examination. Viviani described the 12–13 mm. calyx and the petal lamina with linear obtuse lobes, but did not give any fruit or seed characters. Rohrbach under this name described the capsule as ovate longer than the carpophore, and the seeds as small, while Chiovenda although he had not see the type specimen, described the capsule from other material as elliptic, twice as long as the carpophore and the seeds with lateral ear shaped depressions.

Boissier described a plant from Lower Egypt under the name of *S. obtusifolia* Willd., and this is accepted and followed by Rohrbach and Muschler. There is no material of Boissier's plant at Kew, but from his description and from Egyptian specimens that are available and labelled *S. obtusifolia* it is clear that it is not the Western Mediterranean plant of Willdenow, which is comparatively tall, erect and broad leaved, but almost certainly *S. ligulata* Viv.

The last of these four species under discussion, *S. setacea* Viv., although we have not seen the type specimen, does not present any difficulty.

The full citation for *S. villosa* is given above ; that for the other three species is as follows :—

1. *S. biappendiculata* Rohrb. in Bot. Zeit. 25 : 82 (1867), et Monogr. Gatt. Silene, 105 (1868) ; Boiss. Fl. Or. Suppl. 94 (1888), exclud. *S. canopica* Boiss.

S. canopica Del. Fl. Aeg. Ill. 62. No. 442 (1812)—*nomen nudum.*

Type. Egypt, Damietta ; *Ehrenberg* (not seen).

Distribution. N.W. Egypt.

2. *S. ligulata* Viv. Fl. Lib. Spec. 24. tab. 12. f. 3 (1824) ; Rohrb. Monogr. Gatt. Silene 104 (1868) ; Chiov. in Ann. di Bot. 11 : 403 (1913).

S. obtusifolia Willd. sec Boiss. Fl. Or. 1 : 593 (1867)—non Willd.

S. canopica Boiss. l.c. 596—*nomen illegitimum.*

S. biappendiculata, lusus 3, Rohrb., l.c. 105.

Type. Tripoli ; *Viviani* (not seen).

Distribution. N.W. Egypt.

3. *S. setacea* Viv. Fl. Lib. Spec. 23. tab. 12. f. 2 (1824) ; Boiss. Fl. Or. 1 : 594 (1867) ; Rohrb. Monogr. Gatt. Silene, 105 (1868).

Type. Tripoli, shore of Gulf of Sidra ; *Viviani* (not seen).

Distribution. Morocco, Algeria, Libya, Egypt.

75. Spergula fallax (*Lowe*) *E. H. L. Krause* in Sturm, Fl. Deutsch. ed. 2, 5 : 19 (1901) ; Milne-Redhead in Kew Bull. 1950, 338 (1950).

Arenaria flaccida Roxb. Fl. Ind. 2 : 447 (1832), non Clairv. (1811)—*nomen illegitimum.*

Spergula pentandra L. var. *intermedia* Boiss. Diagn. 2 Sér. 1 : 93 (1853), et Fl. Or. 1 : 731 (1867).

Spergularia fallax Lowe in Hook. Kew Journ. Bot. 8 : 289 (1856).

Spergula flaccida (Roxb.) Aschers. in Verh. Bot. Ver. Brand. 30 : XLIII (1889)—*nomen illegitimum.*

Type. Madeira Island, Porto Sancto ; *Lowe* (not seen).

Arabia. Jebel Amuda–Mishaab ; 15–60 m. ; on slopes of hill ; green fine leaved plant 6 ins. high with very pale mauve flowers ; 7 Apr. 1949, *Dickson* 602.

Distribution. Madeira and Canary Islands, North Africa, Nubia, Egypt, Palestine, Arabia, S. Persia, Afghanistan, Baluchistan, N.W. and Central India.

Portulacaceae.

76. Portulaca oleracea *L.* Sp. Pl. 1 : 445 (1753).

Type. Not precisely designated.

Kuweit. Kuweit gardens ; sea level ; *berbine* ; cultivated by gardeners in Kuweit and eaten as " spinach " ; a fleshy stemmed and leaved plant with yellow flowers, grows during summer May–October and dies with cold weather ; a nice spinach and can be eaten in salads ; 15 Oct. 1948, *Dickson* 567.

Distribution. Widely distributed in warmer parts of the world.

Mrs. Dickson notes that this species is sown in seed beds in early May and transplanted out singly into larger beds. It thrives during the heat and in the hot sun and dies with the first cold spell in November.

Ficoidaceae.

77. Aizoon canariense *L.* Sp. Pl. 488 (1753).

Type. Cult. in horto Upsaliensi ex ins. Canariis (Linn !).

Kuweit. Arafjan ; *ein barin* (eye of camel) ; Mar. 1933, *Dickson* 69. Arafjan and Kuweit ; sea level ; *adaa* ; on clay soil ; a flat growing plant spreading to the size of a man's hand, the oval leaves are very juicy and look as though they had frost on them, flowers reddish green, plant remains green right on into summer ; camels eat this ; 30 May 1935, *Dickson* 205. Masjan Island ; sea level ; prostrate plant with fleshy leaves and hard greeny brown flowers ; 21 Mar. 1938, *Dickson* 444. Kuweit ; sea level ; *adaa* ; in slightly salty ground at edges of beds of herbs ; flat creeping plant with salty leaves and green flowers ; 16 Apr. 1949, *Dickson* 614.

Distribution. Canary Islands, across North Africa to Egypt and Sinai ; Syria, Palestine and Arabia, S. Persia and S. Baluchistan to N.W. India ; Sudan, Abyssinia, South Africa.

78. Aizoon hispanicum *L.* Sp. Pl. 488 (1753).

Type. Spain (Linn !).

Kuweit. Arafjan ; *milleh* (salt) ; in salt marsh ; Mar. 1933, *Dickson* 47.

Distribution. S.E. Spain ; Canary Islands across North Africa to Egypt ; Cyprus, Syria, Palestine, Iraq, Persia.

The fragmentary specimen in the Linnean herbarium is only a vegetative shoot with indications of young flowers at the tips, but it agrees with *Harding* 157 from Palestine which is at a slightly later condition of growth, and so with the distinctly fruiting specimens from Arabia.

Blatter records this species only from the Sinai area, while Schwartz (Fl. trop. Arab. 1939) does not include it at all. Until recently *Dickson* 47 was the only record from Arabia in the Kew herbarium ; it links up with specimens from the Zubair region in Iraq, and with *Kotschy* 190 collected at Dalechi, the only Persian locality represented. The record of Arabian distribution has now been extended further south by the addition of four specimens from the Bahrein Islands, collected in March 1950 by Prof. R. Good (127, 128, 129, 130).

79. Cryophytum nodiflorum (*L.*) *L. Bol.* in S. Afr. Gard. 17 : 326 (1927) & 18 : 84, f. 34 (1928) ; Pax & Hoffmann in Engler & Prantl, Natürl. Pflanzenfam. ed. 2, 16 c. 214 (1934).

Mesembryanthemum nodiflorum L. Sp. Pl. 480 (1753).

Type. Cult. in horto Upsaliensi (Linn !).

Kuweit. Island of Grain, Kuweit Bay ; sea level ; growing in patches over this small island giving a red appearance ; this salty leaved plant has a star shaped white flower and grows in clumps to a height of 10 ins. ; also seen growing at Burgan but very small specimens (228A) ; 30 May 1935, *Dickson* 228. Burgan ; 1935, *Dickson* 228 A. Farsi Island, Persian Gulf (Approx. lat. 28° N. long. 50° E.) ; small piece of plant probably with greenish white flowers ; 17 Mar. 1950, *Lady Hay* (*Dickson* 650).

Distribution. Spain, Mediterranean islands and southern Greece ; Madeira and Canary Islands, across North Africa to Egypt ; Syria, Palestine and Iraq, to the coasts of Persia and Baluchistan; probably introduced into S. Africa and California.

Amaranthaceae.

80. Aerva javanica (*Burm. f.*) *Spreng.* Syst. Veg. 1 : 815 (1825) ; Boiss. Fl. Or. 4 : 992 (1879) ; Schwartz, Fl. trop. Arab. 43 (1939).

Iresine javanica Burm. f. Fl. Ind. 212. [err. typ. 312] t. 65, f. 2 (1768).

I. persica Burm. f. l.c. f. 1.

Aerva tomentosa Forsk. Fl. Aeg.–Arab. CXXII No. 584 and p. 170 (1775).

A. persica (Burm. f.) Merrill in Philipp. Journ. Sci. 19 : 348 (1921) ; Schinz in Engler and Prantl, Natürl. Pflanzenfam. ed. 2, 16c. 51 (1934).

Type. Persia ; herb. Garcin (G ?—not seen).

Arabia. Riyadh ; 660 m. ; *turf* ; among lucerne gardens ; plant with white cottony tails and grey leaves ; 25 Oct. 1937, *Dickson* 393.

Distribution. North temperate and tropical Africa ; Syria, Palestine and Arabia across to India.

As pointed out by Sprague (in Kew Bull. 1928, 342), the earliest name and correct spelling of the genus is *Aerva* Forsk. (1775) and not *Aerua*

Juss. (1789) ; Blatter (Fl. Arab. 400. 1923) used the generic spelling *Aerua* Forsk.

The combination *A. javanica* has been attributed to Jussieu (in Ann. Mus. Paris 2 : 131. 1803) by Boissier and Schwartz, but Jussieu, although he mentioned both *Iresine* and *Aerua* did not make the combination. Sprengel appears to have been the earliest to do this and also to have put together as synonymous the two species *I. javanica* and *I. persica*. Merrill therefore, followed later by Schinz, was incorrect in combining the names under *A. persica*.

This species shows considerable variation in the size, form and indumentum of the leaves and in the length and thickness of the spikes. Schinz has named three varieties, the most distinct being the densely tomentose var. *bovei* Webb which has narrow lanceolate or linear often revolute leaves. The remainder of *A. persica* in the Kew herbarium shows many grades of leaf and spike characters, so that the species is not all easily distinguishable into varietal groups ; in fact the length and thickness of the spike depends to some extent on the stage of development of the inflorescence. *Dickson* 393 has fine elongate spikes of 3–11 cms., while the leaves are oblong obtuse and not very thickly covered with tomentum.

81. Amaranthus angustifolius *Lam.* Encycl. 1 : 115 (1783).

A. graecizans L. Sp. Pl. 990 (1753)—pro parte.

A. " *angustifolius* ssp. *graecizans* (L.) Thell." in Aschers. & Graebn. Syn. Mitt. eur. Fl. 5, 1 : 307 (1914).

Type. Not precisely designated.

Arabia. Riyadh gardens ; 660 m. ; *sinder* ; in gardens under palm and pomegranate trees ; plant 18 ins. high with greenish red flowers and smooth leaves ; 24 Oct. 1937, *Dickson* 382.

Distribution. Occurs in Cyprus, Palestine, Iraq, Arabia, Afghanistan, and in many other areas of the world probably as an introduction.

Dickson 382 was determined as *A. angustifolius* Lam. var. *graecizans* (L.) Thell. by A. W. Kloos Jr. (Nov. 1949), following the nomenclature used by Thellung in his account of the genus in Ascherson & Graebner, Synopsis der Mittel europäischen Flora (5. 1914). His nomenclature under *A. angustifolius*, placing as it does a Linnean species as a subspecies of a later Lamarckian name, is clearly untenable. Thellung himself rejected (l.c. pp. 285–6) the name *A. graecizans* as a species because of its confused usage, now as *A. albus* now as *A. angustifolius*. This view may be accepted, especially as Fernald has recently used the name for *A. blitoides* S. Watson (see Gray, Man. Bot. (ed. Fernald) 603 : 1950). *A. angustifolius* subsp. *graecizans* was used by Thellung as the name for *A. angustifolius* Lam. *sensu stricto*. If we agree to reject the specific name *A. graecizans* the nomenclatural difficulties disappear, as, under the ruling adopted at the 1950 Congress at Stockholm, the full citation for this plant will be *A. angustifolius* Lam. ssp. *angustifolius*.

NOTES FROM THE EAST AFRICAN HERBARIUM.

INTRODUCTION.

On the 9th August 1902 in the Official Gazette the Imperial Governor of German East Africa announced the establishment of The Biologisch-Landwirtschaftlichen Institut at Amani in the East Usambaras, some fifty miles inland from the port of Tanga in what is now known as Tanganyika.

At the time Professor Dr. A. Zimmermann, mycologist, was appointed deputy director, followed by the appointment of Dr. F. Stuhlmann in April 1903 as director. Dr. Stuhlmann actually did not assume duty until May 1905 and only remained in the post till January 1908 after which Dr. Zimmermann was made director and held the post until the end of the 1914-1918 war.

Amongst the functions assigned to the Institute by the then German Government was the study of the flora and fauna of German East Africa and this was followed up by the appointment of two botanists and a zoologist amongst the permanent staff of the Institute. This was the inception of the Amani Institute Herbarium, in 1928 changed to the East African Agricultural Research Station Herbarium, then in 1944 to East African Agricultural Research Institute Herbarium and now with the change of location to Nairobi, Kenya, under the High Commission, as the East African Herbarium.

The first botanists were Dr. A. Zimmermann who filled the posts of deputy director and mycologist and Dr. Braun appointed October 1904, whose main interests appear to have been economic botany.

Later botanists were a Dr. Eichinger, appointed in September 1910, who appears to have been interested in pasture research and Dr. Kraenzlin an orchidologist from January 1908 to January 1910.

From the opening of the Institute to 1914, on the out-break of war, of the nine known visiting botanists who worked at Amani for varying periods one was the famous German botanist Prof. A. Engler who was there in 1902 and again in 1905.

In spite of this galaxy of botanists most of the work on the East African flora was confined to plants of economic use and little was done by the staff of the Amani Institute to increase a knowledge of the East African flora. It was only through the German scientific expeditions, travellers and missionaries, who collected extensively wherever they went, that our knowledge of the flora has been increased.

Both Drs. Zimmermann and Braun collected casually usually when travelling. Warnecke from Togoland, a gardener, at Amani from 1902 to 1907 collected rather indifferently in and immediately around Amani ; another gardener, Grote, stationed at Amani from March 1911 also collected. His collections were good since he seems to have collected several sets of each gathering, there being some fine specimens of his in the Herbarium from Kilimanjaro. It was only during the war, between 1916 and 1918, that Zimmermann really started seriously collecting in the vicinity of Amani.

In 1928 when I was appointed Systematic Botanist to the East African Agricultural Research Station the Amani Institute Herbarium was

housed in seven cases about 12½ ft. tall in a laboratory that was certainly not designed as a herbarium. The rest of the room was festooned with bolts of fibres, a series of wall cases containing botanical miscellanea such as spirit material, wood specimens, fibres, dried fruits, rubbers, rich genetical collections of seeds such as legumes, rices, castor oil, sorghum etc., etc., part of it in very good condition other parts quite useless as the labels had been obliterated by cockroaches and silver fish.

The herbarium proper contained just over 10,000 sheets of named specimens but there were a considerable number of bundles containing a great quantity of unnamed specimens collected by Zimmermann and others just before and during the war years.

There was also a manuscript herbarium list whose last entry number had reached 5,863 *Datura stramonium* entered probably in 1916, collector not stated, but by the time all the unnamed and unnumbered German material had been worked through the total of " German " collected material in the Amani Institute Herbarium totalled 8,613 numbers.

I suppose a herbarium list if used correctly is an useful adjunct in a herbarium for allotting numbers to specimens whose collectors do not number their specimens, but the old German list is a perfect bane. Quite often specimens were sent from Amani to the Berlin Herbarium without any numbers at all ; and a most infuriating example is a small collection made by Engler in and around Amani, duplicates of which with Engler's numbers were sent to Berlin whilst the Amani set are lacking his numbers but are numbered with the Herbarium List numbers. These and others have since turned out to be new to science and have been described. The Amani specimens cannot be cited as types or iso-types as they have only a herbarium number instead of the collectors original quoted number.

Of the 10,000 named specimens in the herbarium proper a limited amount of botanical specimens, named duplicates, had been sent to Amani from the Berlin Botanic Gardens Herbarium. Amongst these are a fairly complete set of Dr. W. Busse's collection made in what was then German East Africa from 1900 to 1904, a set of Warnecke's Togoland collection 1900–1901, a set of Dr. C. Uhlig's collection made in 1901–1904, with C. Jaeger whilst on geological investigations in what is now known as the Northern Province of Tanganyika. Specimens from classical collections are also represented in small numbers such as those of C. G. Ehrenberg (1825) Eritrea ; W. P. Schimper (1837–1863) Ethiopia ; T. Kotschy (1837–1838) Ethiopia ; W. C. H. Peters (1842–1848) Mozambique, of Peters Reise Nach Mossambique Botanik (1862) ; G. Steudner (1861–1862) Eritrea and Ethiopia ; F. Stuhlmann (1888–1901) Central and East Africa ; Staudt (1895) Cameroons ; Scheffler (1899) East Usambaras and some others.

The Busse collection contains over 3,000 gatherings made mostly in South-east Tanganyika, the Warnecke Togoland specimens comprise some 400 numbers whilst the Uhlig collection contains about 1,000 numbers.

These early collections are of value as they contain the types of new species that have been described by taxonomic botanists in European herbaria, mostly in the Berlin Herbarium and although no systematic

Plate 3

The East African Herbarium : south face.

Plate 4

Work bench in the herbarium.

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search has been made for types to date over five hundred have been recorded. The E.A. Herbarium now contains a very useful study collection of over 80,000 named specimens of which over 8,000 are grasses.

With the re-organisation of agricultural research and the absorption of the East African Agricultural Research Institute into the East African Agriculture and Forestry Research Organisation with its headquarters some seventeen miles from Nairobi at Muguga, the E.A.A.R. Institute Herbarium was transferred in August 1950 from Amani to Nairobi to a new building erected for it in the grounds of the Coryndon Memorial Museum on Ainsworth Hill.

With the transfer it was agreed between the Coryndon Memorial Museum Trustees and the East Africa High Commission that the Museum collection comprising some 20,000 specimens should be amalgamated with that from Amani, and the joint collections were to be known as the East African Herbarium.

With the kind permission of the Director of the Royal Botanic Gardens, Kew, Sir Edward Salisbury, C.B.E., D.Sc., LL.D., Sec. R.S., F.L.S., it is proposed to publish, from time to time, in the Kew Bulletin miscellaneous taxonomic notes to be called " Notes from the East African Herbarium ", on work carried out in the East African Herbarium with the assistance of the authorities at Kew. The holo- or isotypes of any new species described will be deposited in the East African Herbarium and the Kew Herbarium.

P.J.G.

POLYGONACEAE.

Polygonum afromontanum *Greenway* nom. nov.

P. paradoxum Th. Fr. jr. in Notizbl. Bot. Gart. Berl. **91,** 33 (1924) non Léveillé in Fedde, Repert. **7,** 339 (1909). *Rob. E. & Th. C. E. Fries* 1271 holotype in museo botanico Upsaliensi.

Three gatherings of this plant were made by the Fries on Mt. Kenya and the Aberdare Range in Kenya in 1922 ; I have since collected it myself, *Greenway* 7719 (EA. & K.) on Mt. Hanang, in the Mbulu District of Tanganyika.

EUPHORBIACEAE.

Dalechampia trifoliata *A. Peter ex Verdcourt & Greenway* (A. Peter annot. in Herb. Amani) sp. nov. in sectione *Triphyllae* Pax et K. Hoffm. aff. *D. Galpini* Pax e desc., petiolo breviore distincta.

Herba perennis, semi-prostrata, ad 25 cm. alta, demum caulibus scandentibus gracilibus pilosis ad 60 cm. longis ; internodia 2–7·5 mm. longa. *Folia* trifoliolata ; stipulae deltoideae c. 2 mm. longae ; petioli usque 1–3·5 cm. longi pilosi ; petioluli nulli vel 1 mm. longi ; foliola margine ± integra, supra sparse puberula, subtus ad nervos puberula et prominenter reticulato-venosa ; foliolum intermedium lanceolatum, acutum, usque 3·5 cm. longum, 0·65 cm. latum ; foliola lateralia basi ± bipartita vel integra, usque 2·7 cm. longa et 0·75 cm. lata. *Inflorescentiae* bisexuales in ramulis subaphyllis graciliter pedicellati, pedunculo puberulo 1·3–9 cm. longo ; bracteae involucrales 1·2–2·5 cm. longae et 0·4–1·2 cm. latae, puberulae, margine glanduloso-denticulatae, flavae, reticulato-venosae, integrae vel ad medium 3-fidae, lobis acutis ad 6 /

1·5 mm. longis et latis ; stipulae 4, deltoideae, puberulae, 2·5 mm. longae et 1·2 mm. latae, acutae ; bracteae 2 intermediae oblongae, 2 mm. longae, 1·5 mm. latae, apice concavae, laterales liberae, 1 mm. longae et 0·8 mm. latae. *Pedicelli* ♀ 1-flori, usque 1·2 mm. longi ; *Sepala* ♀± 5, puberula, trifida vel pinnatifida, 3 mm. (demum 6 mm.) longa. *Ovarium* puberulum, 1 mm. altum et 1·5 mm. latum, 3-loculare. *Ovula* in loculis solitaria. *Columna* stylaris cava, glabra, ± 5·5 mm. longa, ad apicem versus dilatata. "*Pedunculi*" ♂ puberuli, 3 mm. longi, 12-flori, bracteae in urceolum integrum 5·5 mm. latum et 3 mm. altum, ± glabrum vel sparse ciliatum connatae ; pedicelli usque 3 mm. longi. *Sepala* ♂ 4, 1·7 mm. longa et 1 mm. lata. *Stamina* ± 9, filamentis basi connatis, antheris 0·6 mm. longis 0·4 mm. latis. *Capsula* puberula, 8 mm. lata.

Tanganyika. Saadani, on neglected cultivated plantations, 18 Aug. 1909, *Kraenzlin* A. H. 2970 (EA.). Msubugwe, 29 km. SW. of Pangani, 167 m., 17 March 1950, *Verdcourt* 113 (Holotype in EA. ; isotypes in K., PRE., and MO.) :—Small semi-prostrate herb with peculiar yellowish flowers, locally common with *Hydnora* in thicket forest of *Pterocarpus*, *Pleurostylis*, *Brachystegia*, *Ostryoderris*, and *Sclerocarya* on sandy soil ; native name "Mbawa" (Kiswahili). Usagara Mountains rec. 8/1884 *Kirk* s.n. (K.).

Kenya. Kwale, 267 m., Aug. 1929, *Graham* Q523 (K., EA.) :—Small climber on grass, to 0·6 m., with greenish flowers.

It appears to be a species of the coastal belt. The inflorescence is supported by two yellowish bracts, one entire and the other irregularly trilobed. At the base of these and forming a whorl with them are 4 deltoid bracts corresponding to stipules, 2·5 mm. long and 1·4 mm. broad. Each inflorescence contains two parts, a single pedicellate female flower and a pedunculate cluster of up to 12 male flowers, contained in a semicircular involucre. The male flowers are mixed with about 2 convoluted glands 1·5 mm. long. The species would also appear to be distinguished by having only one female flower per inflorescence in the material examined.

Glover & Gilliland 430 (small bushy plant of the red sand in open places 0·3–0·6 m. between Walwal and Sirauw 26/11/44) from British Somaliland is a very similar plant but the leaflets are coarsely dentate, and the lateral ones more markedly bipartite. The inflorescence bracts are also broader and ± deeply tripartite. Further material is required.

Braun A.H.1553 "Voi, Steppe 30/3/1907" has been labelled "*D. tomentella* n. spec." by A. Peter. The leaflets are velvety and slightly joined at the base. The material is quite insufficient for description.

Drypetes bipindensis (*Pax*) *Hutch.* in F. T. A. **6,** 679 (1912).

I convinced myself whilst working at Kew that the specimen cited below collected in the Ishasha Gorge belonged to this species. It is thus a further link between this locality and West Africa.

Uganda. Kigezi District, Ishasha Gorge, 1500 m., 10 February 1945, *Greenway & Eggeling* 7094 (EA., K.) :—A much branched evergreen tree up to 25 ft. tall with clusters of almost sessile oval green fruits on the lower branches below the leaves ; not very common in *Carapa*, *Cassipourea*,

Piptadenia buchananii, *Parinari excelsa*, *Entandrophragma excelsum* evergreen rain forest on the upper slopes of rocky gorges. B.V.

Maesobotrya purseglovei *Verdcourt* sp. nov. affinis *M. floribundae* Benth. var. *sparsiflorae* Scott Elliot Pax & Hoffm. et var. *schweinfurthii* Pax, Pax & Hoffm., habitu maiore, foliis basi valde cuneatis distincta.

Arbor c. 20 m. alta ramosa, ramuli teretes, ± setuloso-pilosi, cortice ± cinereo-brunneo longitudinaliter rugoso. *Folia* elliptica vel oblongo-oblanceolata, 3·2–15·5 cm. longa, 1·3–5·6 cm. lata, basi distincte cuneata, apice acuminata vel cuspidata (cuspide circiter 3–8 mm. longa), margine setulose glandulo-subdentata, supra glabra, siccitate nigro-viridia, subtus ad nervos ± sparse puberula, olivacea siccitate, chartacea; nervi laterales 5–8 jugi, supra plani, subtus prominentes, arcuati; petioli 0·5–6·0 cm. longi, pilosi; stipulae lanceolatae, hirsutae, 3 mm. longae, mox deciduae. *Flores* dioici, apetali. *Racemi* 1–3 in axillis foliorum, graciles, pubescentes, 3–8 cm. longi. ♂ *pedicelli* 2–3 mm. longi; bracteae brevissimae. *Calyx* ♂ 1·3 mm. latus, 4-lobus; lobi ovati obtusi, 1 mm. longi et 1·5 mm. lati; discus ± pilosus. *Stamina* 6, filamentis 1·4 mm. longis, antheris 0·6 mm. latis, 0·2 mm. longis. *Ovarii rudimentum* columnare, pilosum, 0·4 mm. longum. ♀ *pedicelli* 1·2 mm. longi, fructigeri 4 mm. attingentes. *Calyx* ♀ 1·3 mm. longus, 0·6 mm. latus, 4-lobus; lobi ± glabri, obtusi, 1·1 mm. longi; discus 0·3 mm. altus, ciliatus. *Ovarium* glabrum, 1·1 mm. altum, 2-loculare. *Styli* 2, bilobi. *Fructus* ellipsoideus, glaber, saepe monospermus, ad 7 mm. longus. *Semen* purpureum, ovoideum, 6 mm. longum, 3·5 mm. latum.

Uganda. Kigezi District, Ishasha Gorge, 1667 m., 10 February 1945, *Greenway & Eggeling* 7102 (Holotype EA., isotypes K. and PRE.):—A much branched evergreen tree up to 20 m. tall with racemes of small green fruits containing purple solitary seeds; very local with *Mimusops*, *Cassipourea*, *Allanblackia*, and *Macaranga* in *Piptadenia buchananii*, *Parinari excelsa* and *Carapa* evergreen rain-forest on the steep slopes of a rock gorge. Same locality, in forest, 1400 m., May 1950, *Purseglove* 3438 (K., EA., AW.):—Understorey tree to 20 m., female flowers greenish cream. Same locality, *Purseglove* 3437:—Spikes of cream male flowers; native name "Ekizogo" (Lukiga).

This species has glands on the margins of the leaves which bear tufts of short hairs, a character which will distinguish sterile material very easily, and which is shared by its close W. African relatives. It is yet another member of the typically W. African genera which are so characteristic of Ishasha Gorge.

The genus *Thecacoris* was for many years represented by West African species. Recently Léandri has described *T. perrieri* from Madagascar and the following species from the Usambaras appears to be new. Whilst working at Kew the author could match it with no species represented there.

Thecacoris usambarensis *Verdcourt* spec. nov. ab omnibus speciebus adhuc descriptis petalis nullis, foliis minoribus, ovario glabro differt.

Frutex usque 1·3 m. altus. *Rami* juniores puberuli mox glabri et longitudinaliter rugosi, brunnei. *Ramuli* laterales usque 9 cm. longi.

Folia elliptica, ± acuminata, usque 6 cm. longa et 3·1 cm. lata, margine obscure crenata ciliata, subtus primum puberula mox glabra, supra glabra ; nervi laterales utrinque 7–8 ; petioli usque 4 mm. longi. *Flores* dioici. *Spicae* ♂ 3·6·5 cm. longae, puberulae, multiflorae, bracteis triangulo-acuminatis ciliatis 1·7 mm. longis et latis. *Calycis segmenta* ♂ 5, suborbicularia, 1 mm. longa et 1·2 mm. lata, ciliata. *Calycis tubus* 1 mm. longus. *Pedicelli* usque 1·9 mm. longi. *Petala* nulla. *Disci* 5-lobati, ciliati. *Stamina* 1·8 mm. longa inter lobos disci connata. *Ovarii rudimentum* obconicum, ciliatum, 1 mm. longum et 1·2 mm. latum. *Spicae* ♀ 3 cm. longae. *Pedicelli* 1·5 mm. longi. *Calycis segmenta* ♀ 5, ovata, 1·2 mm. longa et 0·7 mm. lata, margine ciliata, extus puberula. *Disci* crenati, ciliati. *Styli* crassi, 6 mm. longi, 4 mm. lati. *Stigmata* bifida, 2 mm. longa. *Ovarium* 3-loculare, glabrum, rugosum ; ovula in loculis gemina, rugosa. *Spicae* fructiferae usque 7·5 cm. longae. *Pedicelli* fructiferi 5 mm. longi. *Capsula* glabra, obscure reticulata, valde triloba, depressa, 7 mm. diametro et 3·5 mm. longa, lobis obtusis. *Semina* ovoidea, curvata, 2·2 mm. longa et 1·5 mm. lata, brunnea longitudinaliter pallide obscure striata.

Tanganyika. East Usambaras, Mgambo, 260 m., 26 March 1940, *Greenway* 5929 (Holotype EA., isotype K.) :—" Sekigoto " (Kishambaa) ; powdered root used as a medicine by men to prevent other men having affairs with their wives ; a shrub to 1·3 m. tall with racemes of small yellow flowers, ♂ on separate plants from the ♀ ; locally common in *Stereospermum kunthianum*, *Markhamia* spp. *Annona chrysophylla* secondary bush.

The disc in the male flowers consists of spathulate hairy lobes connate with the bases of the filaments and the rudimentary ovary is hollow. The fruits dehisce into six separate parts.

PAPILIONACEAE.

Tephrosia rensburgii *Verdcourt* sp. nov. ab omnibus speciebus africanis adhuc descriptis habitu procumbente, leguminibus oblongis compressis 18 mm. longis et 7·5 mm. latis differt.

Herba perennis, caulibus 20–30 cm. longis hirsutis prostratis. *Folia* usque 6·5 cm. longa, 9-foliolata ; petioli usque 1·3 cm. et petioluli usque 1 mm. longi ; stipulae deltoideae 5 mm. longae et 2 mm. latae ; foliola elliptica vel oblongo-obovata, 1·3–2·3 cm. longa et 7–12 mm. lata, apice obtusa et mucronata, supra glabra, subtus pilosa ; nervi laterales 7–9-jugi. *Racemi* axillares 2–7 cm. longi, (interdum etiam flores solitarii) ; pedicelli 3 mm. longi. *Calycis tubus* 2 mm. longus, extra ± pilosus ; lobi deltoidei, 2·5–3·5 mm. longi. *Vexillum* rotundatum, unguiculatum, 9·5 mm. longum et 8 mm. latum, extra pilosum. *Alae* oblongae, 9 mm. longae et 3 mm. latae. *Carina* 9 mm. longa et 4 mm. lata, dorso curvata. *Stamina* 7 mm. longa ; antherae ± 0·8 mm. longae. *Ovarium* hirsutum ; stylus circiter 6 mm. longus. *Legumen* valde compressum, oblongum, 1·8 × 0·75 × 0·3 cm., extra hirsutum, 1–3-spermum. *Semina* ± oblonga, 4 mm. longa, 3 mm. lata.

Tanganyika. Nzega District, Ndola, in abandoned shambas, 25 August 1945, *H. J. van Rensburg* 56 (holotype EA) :—prostrate herb

growing in very sandy soil. Iringa, *Emson* 579 (EA., K.) Singida, 1 March 1936, *Staples* 433 (EA., K.).

This very distinct-looking species does not fit into any of the poorly defined series used by E. G. Baker for the discrimination of members of the African assemblage, nor does it resemble any of the admittedly limited number of species which I have been able to examine material of.

AMPELIDACEAE.

Rhoicissus revoilii *Planch.* in DC., Monog. Phan. **5,** 469 (1887).

A sterile specimen which is without doubt this species was recently brought in for identification by Mrs. Nattrass of the Scott Agricultural Laboratories, Nairobi. It had been collected locally. The attached rootstock is altogether extraordinary and seems worthy of note since no mention of the rootstock could be found in the literature. The thick horizontal branches of the root bore large spherical tubers up to 12·5 cm. diameter hanging by thin branch rootlets 2·5–7·5 cm. long and only 3 mm. diameter. B.V.

RUBIACEAE.

Bertiera globiceps *K. Schum.* in Engl. Bot. Jahrb. **23,** 451 (1897).

This species, originally described from the Cameroons, was found by Messrs. P. J. Greenway and W. J. Eggeling in the Ishasha Gorge, a locality remarkable for its extreme West African affinities even for a part of Uganda whose flora is well known to exhibit these affinities.

Uganda. Kigezi District, Ishasha Gorge, 1670 m., 10 February 1945, *Greenway & Eggeling* 7100 (K., EA.) :—A much branched evergreen shrub, with heads of small white flowers at the ends of the branchlets, about 8 m. tall ; not very common in *Elaeodendron*, *Cassipourea*, *Macaranga*, *Carapa*, *Parinari excelsa*, *Entandrophragma excelsum*, *Piptadenia buchananii* forest (evergreen rain-forest) on the upper slopes of a rocky gorge.

Whilst at Kew I found this gathering to be an exact match of the type. It is worth mentioning that Hutchinson's key to the tribes of *Rubiaceae* in West Tropical Africa (F.W.T.A. **2,** 66) published long after the founding of *B. globiceps* is quite inaccurate where it states " flowers never in globose heads " for the *Hameliae*. B.V.

Bertiera capitata *De Wild.* in Ann. Mus. Congo, ser. 5, **2,** 169 (1907). This species also appears to be much more widely distributed than previously thought. Two sheets are represented in the E.A. Herbarium.

Tanganyika. Bukoba District, Busira, 1935, *Gillman* 294 (EA., K.) :—Bush in the forest.

Uganda. Buganda, Kyewaga Forest near Entebbe, 1200 m., 6 February 1949, *Dawkins* 358 (EA., ENT., K.) :—Coppice shoots 5 m. high of small tree ; inflorescence globose with protruding green bracts ; corolla white with yellow hairs at throat ; calyx green ; fruits green, in globose heads 10 cm. in diameter.

This species has larger leaves than *B. globiceps* and the fruits are ellipsoidal, ± 1 cm. diam., on stipes up to 2 cm. long. B.V.

Gardenia abbeokutae *Hiern* in F.T.A. **3,** 104 (1877).

This species originally described from Abeokuta in Nigeria has for long been known from Sigi in the East Usambaras, at the foot of the hill up to Amani. It is represented by the following gatherings in the East African Herbarium.

Tanganyika. E. Usambaras, Sigi Sengele, 500 m., 22 April 1950, *Verdcourt* 165 (EA., K.) : –Scandent spiny shrub with leaves shiny above ; flowers large, greenish-white with the tube green at the base ; style hairy for one inch in the middle ; stigma white, large, fusiform, and composed of soft pithy tissue ; calyx green and ovary yellow ; apparently quite native, rare under rubber trees with *Rytigynia* and *Setaria.* Identical bush, 22 June 1950, *Verdcourt & Hesse* 268 (EA., K.) :—in immature fruit, the largest being the size of a gooseberry, pale yellow green in colour with longitudinal green stripes ; persistent calyx-teeth green ; branches are spiny and rather scandent. Longusa, 31 May 1917, *Zimmermann* A. H. 7821 (EA.). Sigi, 12 December 1916, *Zimmermann* A. H. 7822 (EA.). Kwamkuyu Falls (near Amani) December 1907, *Zimmermann* A. H. 1490 (EA.) :—"strauch bl. weiss." Sigi, *Burtt* 485 (K.).

I know of no stations in between West Africa (where it is widely distributed) and that in the East Usambaras.

This very remarkable distribution is explainable by only two means, either the plant is an introduction or the localities are relicts of a much wider continuous distribution. It is true that Amani has many hundreds of introduced plants including some from West Africa, but records were usually kept, and it is difficult to believe that it was introduced unwittingly. Against the view of considering it native is the fact that all the records are from near the same locality. B.V.

Hypodematium *A. Rich.* and **Mitracarpum** *Zucc.*

A great deal of confusion appears to be rife in all herbaria in connection with the genus *Borreria* and its closer allies. Since many false determinations have been sent out from both Kew and smaller herbaria it seems advisable to mention two of the more outstanding errors.

A great deal of material called *Borreria ruelliae* K. Schum. is in truth *Mitracarpum verticillatum* Vatke. *Burtt* 2482 from Mwanza and *Chandler* 261 from Serere issued from Kew are examples. Judging by material recently revised in the East African Herbarium the species is widely distributed and there are sheets from Nzega, Shinyanga, Mwanza, Bukoba, Mlinga in the East Usambaras, and Tabora, in Tanganyika, and from Yumbe Soroti, Serere and other districts in Teso in Uganda. It has also frequently been called *Borreria compacta* K. Schum. Dr. Eggeling records that this species is called *Etakulari* in Teso and is a grain food.

A further and possibly larger portion of "*Borreria ruelliae*" is *Hypodematium sphaerostigma* A. Rich. It is difficult to say how much however since only fruiting material can be satisfactorily distinguished. *Chandler* 557 distributed from Kew as *Borreria* is this species and was collected at Serere, Teso, and *Napier* in C.M. 12558 collected in the Lambwe Valley, S. Kavirondo, Kenya, is also. It is undoubtedly very much more widely distributed than was previously supposed. B.V.

Otomeria volubilis (*K. Schum.*) *Verdcourt* comb. nov.

Pentis volubilis K. Schum. in Engl., Bot. Jahrb. **23**, 421 (1897).

Otomeria Batesii Wernham in Journ. Bot. **54,** 226 (1916).

Pentas Descarei De Wild. & Durand in Comp. Rend. Soc. Bot. Belge **38,** 198 (1900).

This distinct species which forms a section in the genus *Otomeria* occurs in Liberia, Nigeria, Cameroons, Belgian Congo (common) and Uganda. It has been referred to *Pentas* since the inflorescence does not elongate into a spike even when the fruits are mature. The shape of the corolla-lobes and fruits and the colour of the flowers are all indicative that Wernham was correct. The affinities of the species will be dealt with at length elsewhere.

Pentanisia arenaria (*Hiern*) *Verdcourt* comb. nov.

Pentacarpaea arenaria Hiern in Cat. Afr. Pl. Welw. **1** (2) 439 (1898).

Pentanisia pentagyne K. Schum. in Engl., Bot. Jahrb. **33,** 350 (1903).

Through the courtesy of the Curators of the herbaria at Coimbra and Vienna I have been able to examine isotypes of the two plants in question and there is no doubt that in the fruits of the type of *Pentacarpaea arenaria* there is but one pendulous ovule per cell. Hiern's new genus is therefore unfounded but may be used as a section of *Pentanisia* if it is needed.

Pentanisia confertifolia *Baker*, *Verdcourt* comb. nov.

Pentas confertifolia Baker in Kew Bull. **1895,** 67 (1895).

A detailed study of this interesting plant will be published when the genus and its relatives are monographed as a whole, but the new combination is being validated here. The solitary pendulous ovules clearly indicate that this plant can not be a *Pentas*, notwithstanding its casual resemblance to *P. decora* Sp. Moore (=*P. verticillata* K. Schum. MS.) but at first sight it seems out of place in *Pentanisia*, since the ovary is 5-locular and the flowers large. *Pentanisia* is however a much more variable genus than was previously supposed and many of the species have 3–5 locular ovaries, e.g. *P. arenaria* (Hiern) Verdcourt, *P. veronicoides* Baker, K. Schum. and the abundant *P. ouranogyne* Sp. Moore may have 2, 3, 4 and 5-locular ovaries in the same inflorescence, thus showing that the character is of little value in this genus. Baker's name is inappropriate and his reference to "foliis in verticillis densis confertis" is inaccurate. The leaves are paired and the verticillate effect is due to arrested leafy axillary branchlets. Baker was very unfortunate with the '*Pentas*' species he described about this period. Three others have proved to be species of *Kohautia*, *Otomeria* and *Borreria* respectively. It can not be too often emphasised that a complete examination of the ovary and ovules is essential before describing new species in the *Rubiaceae*. The typical form of the species appears to be rare.

Northern Rhodesia. Fwambo, Lake Tanganyika, 1894, *Carson* 23 (K., holotype); same locality 1889, *Carson* s.n. (K.); same locality, *Carson* 113 (K.). Abercorn, *Fries* 1255 (UPS.) :—flowers white. Same locality, secondary *Brachystegia* woodland, 1800 m., 15 June 1951, *Bullock* 3966 (K.) :—erect perennial to 0·5 m. from woody rootstock; flowers

white, anthers livid blue. Same locality, *Brachystegia* woodland, 22 December 1949, *Bullock* 2126 (K.) :—Fairly frequent in small colonies; erect tufted herb to 0·75 m. ; flowers white.

P. confertifolia (*Baker*) *Verdcourt* forma **glabrifolia** *Verdcourt* forma nova, a *P. confertifolia* typica foliis glabris differt. The corolla-lobes and calyx-tube of this form are glabrescent externally, whereas those of the type are pubescent in a similar manner to the corolla-tube.

Northern Rhodesia. Abercorn–Lungwa, 8 km. north of the latter, 19 October 1947, *Greenway & Brenan* 8238 (EA., holotype of forma, K., PRE., isotypes of forma) :—A perennial virgately branched herb with numerous stems up to 0·6 m. tall from a woody rootstock and long tubular white flowers : uncommon with *Pteridium*, *Smilax*, *Euclea*, and *Annona* in a grey sandy loam on the upper edges of a dry dambo which had been burnt by grass fires. Abercorn, secondary scrub on red soil, of December 1949, *Bullock* 2076 (K.) :—Dimorphic forms in different patches (mixed with typical form).

Pentanisia monticola (*Krause*) *Verdcourt* comb. nov.

Otomeria monticola Krause in Engl., Bot. Jahrb. **57,** 26 (1920).

This rare species is well characterised by its paired axillary inflorescences. The ovules are solitary and pendulous and any resemblance to *Otomeria* is completely superficial. It is closely related to *P. foetida* Verdcourt which also has axillary inflorescences and no true terminal ones but in *P. monticola* even the lowest nodes bear inflorescences and the flowers are smaller.

Tanganyika. Rungwe, Kyimbila, 1400 m. *Stolz* 1286 (K., W., Utrecht, Lund, Type). Between Kondowe and Karonga, 2000 m. June 1896 *Whyte* s.n. (K.).

Northern Rhodesia. Katoka, Abercorn, fire-protected *Brachystegia* woodland, 1500 m., 12 March 1950, *Bullock* 2625 (K.) :—Weakly erect ; flowers white or very pale purple.

Pentas decora *S. Moore* in Journ. Bot. **48,** 219 (1910) (emend.).

P. Homblei De Wild. in Fedde, Repert. **13,** 109 (1904).

P. verticillata K. Schum. ex Scott Elliot in Journ. Linn. Soc. Bot. **32,** 431 (1896), *nomen nudum.*

[*P. longituba* (non K. Schum.)—Krause in Notizbl. Bot. Gart. Berlin **10,** 602 (1929).]

This exceedingly distinct and uncritical species has been the subject of incredible confusion. The prolonged use of the MS. name *verticillata* (e.g. Bullock in Kew Bull. **1933,** 80 : 1933) after the species had already been described twice obscured the valid names. Also it has been persistently misidentified with *P. longituba* K. Schum., a species which differs *toto caelo* from *P. decora.* A full account of this species, which is widespread throughout tropical Africa, will be given in a monograph of the genus at present being prepared by the writer. *Pentas globifera* Hutch. in Kew Bull. 1921, 374 (1921) is but a variety of this species. B.V.

Pentas purpurea *Oliv.* in Trans. Linn. Soc. **29,** 83 (1873).

Pentas stolzii K. Schum. & K. Krause in Engl., Bot. Jahrb. **39,** 522 (1907).

Through the kindness of the Director of the Royal Botanic Gardens, Kew, I have been able to examine *Speke & Grant* 140, the type of *P. purpurea* Oliv., an excellent specimen with superb field-notes. This examination has shown that an error has been perpetuated for some 70 years. It has widely been synonymised with *P. zanzibarica* (Kl.) Vatke but is not that species. Up to the present I had accepted this synonymy and considered *P. stolzii* to be a closely related species with a congested inflorescence and different flower indumentum. K. Schumann & K. Krause were similarly misled when they described *P. stolzii*. *P. purpurea* and *P. stolzii* are undoubtedly the same species and the latter must be sunk. B.V.

Virecta major *K. Schum.* in Engl., Pfl. Ost.-Afr. **C.** 377 (1895).

V. Kassneri S. Moore in Journ. Bot. **48,** 220 (1910).

Pentas fililoba K. Krause in Mildbr., Wiss. Ergebn. Deutsch. Zentr.-Afrik.-Exped. 1907–1908 **2,** 312 (1910).

V. multiflora auctt. non Smith.

The large shrubby species, occurring in East Africa particularly in the area of the Great Lakes, and also in the Belgian Congo and Cameroons, differs in indumentum and disc characters from true *V. multiflora*. K. Schumann later synonymised his new species with *V. multiflora* Sm. (in Engl., Bot. Jahrb. **23,** 422 : 1896), perhaps because he saw a West African specimen which he thought was true *V. multiflora*. A fragment of the type of *Pentas fililoba* Krause exists in the herbarium at Brussels. It is odd that Krause made this error since he mentions *V. multiflora* itself on the page following his description of *P. fililoba*.

It is worth pointing out that although all authors mention the "glabrous throat" of *Virecta*, careful examination actually shows that there is a ring of hairs below the throat. The name *Virecta* Sm. is preoccupied by *Virecta* L. f. Suppl. 17 (1781). Dr. C. E. B. Bremekamp (*in litt.*) informs me that he is dealing with this problem. I feel that so old a name could be conserved in its present usage. A complete account of this genus is in preparation. B.V.

COMPOSITAE.

Hypericophyllum compositarum *Steetz* in Peters, Reise Mossamb., Bot. **2,** 499, t. 50. (1864).

H. elatum (O. Hoffm.) N.E. Br. in Journ. Linn. Soc. Bot. **35,** 122 (1902).

H. scabridum N.E. Br. in Journ. Linn. Soc. Bot. **35,** 122 (1902).

During the naming of a very large collection of plants from Portuguese East Africa considerable difficulty was experienced in naming members of the genus *Hypericophyllum* and it is suggested that the above three species are in truth but manifestations of one species. The characters given by Brown do not hold good. Intermediates may be found in leaf-shape. Specimens with true cordate leaves occur, cordate petioled leaves, petioled less cordate leaves and finally cuneate leaves. The degree of

hairiness is extremely variable. Moreover those forms with broadly cuneate leaves often are not quite glabrous and the involucral bracts are ciliate, so these characters do not hold. It would be very valuable if collectors could make observations on a population of the plant. B.V.

CONVOLVULACEAE.

Cuscuta blepharolepis *Welw. ex Hiern* in Cat. Welw. Afr. Pl. **1** (3), 743 (1898).

This species, previously known (as far as I am aware) only from the type gathering, a specimen collected by Welwitsch 6140, in Pungo Andongo, Angola, has recently been collected by Dr. J. T. Baldwin Jr. in French Guinea, thus considerably increasing the range.

French Guinea. N'Zéré Kore, on top of Mt. Kore, 165 miles N.E. of Monrovia, 830 m., September 1949, *Baldwin* 13280 (K.). B.V.

BIGNONIACEAE.

Fernandoa magnifica *Seem.* in Journ. Bot. **8,** 280 (1870) var. **lutea** *Verdcourt* var. nov. ab *F. magnifica* typica floribus luteis non rubris foliis subtus ad nervos pubescentibus differt.

Tanganyika. Southern Province, Lindi District, Rondo Plateau, October 1950 and February 1951, *J. Bryce* in *Eggeling* 6044 Holotype EA., isotype K.) :—Tree 26 m., emergent in closed forest ; bark grey-brown, striated ; slash red-brown, white below ; flowers yellow, borne when tree leafless and without fruits. Leaves from same tree collected later by W. J. Eggeling. Native Name " MMERA " (Wamwera).

There do not appear to be any real reasons to support the view at first thought probable, that this is a new species. The flower-structure is identical though they are a little smaller than some. Also the inflorescence-rachis is woodier and gnarled with leaf-scars, i.e. the flowers are borne on older shoots. The pubescence on the under surface of the leaflets might be thought a more valuable characteristic since the typical form is said to have glabrous leaves, but a careful examination has shown that there is often a small amount of pubescence on the under side of the leaflets in the typical form. It is wisest to consider it a variety until more is known about the variation ; but it must present a very different aspect in the field from the familiar typical scarlet form.

LABIATAE.

Becium albostellatum *Verdcourt* sp. nov. planta ± dense stellato-tomentosa valde distincta.

Frutex caulibus tetragonis sulcatis dense stellato-tomentosis ; internodia usque 1–3 cm. longa. *Folia* breviter petiolata ; lamina oblongo-lanceolata basi cuneata, apice leviter acuta, usque 3·3–7 cm. longa, 0·9–2·2 cm. lata, supra stellato-tomentosa, subtus dense stellato-tomentosa et glandulo-punctata, margine integra vel serrata ; nervi laterales ± 8, subtus prominentes ; veni tertiarii reticulati ; petiolus brevis, supra sulcatus, usque 2–5 mm. longus. *Inflorescentiae* terminales usque 3·6–12·5 cm.longae, apice bracteis coloratis. *Bracteae* ovatae 7 mm. longae,

4 mm. latae, mox deciduae. *Flores* verticillati, verticillis primum spicatim confertis deinde post anthesin disjunctis ; pedicelli in fructo lignosi, persistentes, 1–3 mm. longi. *Calyx* campanulatus, 6 mm. longus (in fructo usque 9 mm. longus), extra stellato-tomentosus, labio postico obovato 2·5 mm. longo decurrente, antico oblique truncato apice bimucronato. *Corollae tubus* 5·5 mm. longus, basi 2 mm. latus, apice 3 mm. latus, labio supero rotundato 4 mm. lato, labio infero 7 mm. longo 6·5 mm. lato extra stellato-tomentoso 4-lobato lobis rotundatis. *Staminum filamenta* ex corollae tubo longe exserta 15–18·5 mm. longa, posticis basin versus appendice tomentosa 1·5 mm. longa munitis. *Stylum* glabrum, 20 mm. longum.

Tanganyika. Tabora, Simbo Camp, June 1938, *Wigg* F. H. 1144 (EA.) :—Munwanzuki (Nyam.) " The Bee's Drink " ; gregarious in places on sand and sandy clays in dry forests. Tabora, 1939, *Lindeman* 354 (EA.). Shinyanga, *Koritschoner* 2044 (holotype EA.) :—Kazikazi 1400 m., 12 June 1932, *Burtt* 3715 (EA., K.), Tabora, Simbo Reserve, *Tanganyika F.H.* 1890 (E.A.).

Under an ordinary lens the indumentum appears normally stellate but under high powers it is seen that the hairs are not truly stellate in that the branches are not all confocal, but are irregularly branched. This rather strikingly distinct species is closely related to another apparently undescribed species of which *Hornby* 2056 is an example. This has however a simple indumentum. It seems unlikely that indumentum would vary in actual character, though in several genera (e.g. *Barleria*) there are species seeming very closely related save for the same indumentum differences.

The Yeasts.*—This mature and important work is primarily a revision of three preliminary monographs of yeasts published between 1931 and 1942 by the Yeast Division of the Centralbureau voor Schimmelcultures, Delft and is based on a detailed study of 1317 strains. As is so often the case where taxonomic work involves prolonged consideration of a long series of cultures a fairly wide concept of species has been adopted, frequently considerably wider than that in the earlier monographs. Hence a very large number of published names has been relegated to synonymy. Thus, that cosmopolitan pathogen *Candida albicans* (Robin) Berkhout, of which 171 strains were studied, all isolated from man or animals, is credited with 87 synonyms, only 8 of them obligate. To *Saccharomyces cerevisiae* Hansen are assigned 67 strains, including not only brewer's and baker's yeasts but others isolated from molasses, wines, dates, strawberries, cocoa, holly berries, palm juice, exudations of oak trees, soil and human lungs. Only one species has been maintained in the plant pathogenic genus *Nematospora* viz. *N. coryli* Peglion.

In defining taxonomic units the main principle has been to give first rank to morphological characters, especially at the generic level, but in differentiating species physiological properties have been widely employed. Fermentative properties in particular have proved to be fairly stable and changes reported in them have been mostly of a quantitative not qualita-

tive nature. The abilities to assimilate unfermented sugars and nitrates are also important characters while the property of splitting arbutin has been used in delimiting genera. Standard media and methods for evaluating these physiological properties are specified by the authors and there are detailed keys for determination of all the genera and species recognised.

A yeast-like habit appears to have arisen more than once in the evolution of fungi. Hence the authors distinguish three main groups of species, occupying widely separated stations in the mycological system.

(1) Ascosporogenous yeasts, assigned to the Ascomycetes, family Endomycetaceae.

This includes 16 genera and 92 species arranged in 5 subfamilies : Eremascoideae, mycelial fungi not described in the book ; Endomycetoideae, of which the typical genus *Endomyces* is mycelial and hence also excluded ; Saccharomycetoideae, with 9 genera ; Nematosporoideae, with 3 genera and Lipomycetoideae with 1 new genus, *Lipomyces*.

(2) Yeasts in which ballistospores are formed on a sterigma and ejaculated by the drop-excretion method otherwise known only in Basidiomycetes. These are placed in the family Sporobolomycetaceae, with 2 genera and 9 species, but the authors hesitate to relegate the family to the Ustilaginales and leave its position in the system uncertain. The genera *Tilletiopsis* Derx and *Itersonula* Derx, sometimes placed here, are not treated in the present work as they form true mycelia.

(3) Yeasts with neither ascospores nor ballistospores, referred to the Fungi imperfecti family Cryptococcaceae, with 9 genera and 87 species, including many important pathogens of man and animals.
Gaumann's family Spermophthoraceae has been rejected and of its component genera only *Nematospora* has been treated. *Eremothecium* and *Ashbya* are mycelial fungi and the authors suggest the close resemblance between their spores and those of *Nematospora* may be due to their similar modes of parasitism. From the nomenclatorial standpoint the treatment of *Debaryomyces* is distinctly unorthodox. The type species of Klocker's genus, *D. globosus* Klocker, has been transferred to *Saccharomyces* and the genus then redefined to exclude the type. Hence the name *Debaryomyces* Lodder & van Rij is proposed for conservation against *Debaryomyces* Klocker 1909. Editors of mycological textbooks, who often describe the method of conjugation in *Zygosaccharomyces barkeri* Sacc. & Syd. should note that the available strains maintained under this name proved to be *Saccharomyces rouxii* Boutroux var. *polymorphus* (Kroemer & Krumbholz) Lodder & van Rij. The genus *Zygosaccharomyces* must in any case be rejected as it is merely a haploid state of *Saccharomyces*.

In spite of its high price this manual will be found indispensable by all workers in the same field of industrial mycology and veterinary pathology and the authors are to be congratulated on their masterly treatment of such a mass of apparently unpromising material.

R. W. G. Dennis.

*The yeasts, a taxonomic study. J. Lodder & N. J. W. Kreger-van Rij. North Holland Publishing Co., Amsterdam. Pp. xii-713, 1952. £6. 10.0.

THE GENUS TRIFOLIUM IN SOUTHERN ARABIA AND IN AFRICA SOUTH OF THE SAHARA.

J. B. Gillett

It has up to now not been possible to identify *Trifolium* species from Tropical Africa without access to one of the great herbaria. The earlier accounts by Richard (1847) and J. G. Baker (1871) were prepared before the majority of the species were known, while the key provided by E. G. Baker 1926 is often misleading. Recently a key to the Abyssinian species has appeared Fiori, 1949 which is accompanied by valuable illustrations. Unfortunately, owing to the war, Prof. Fiori was not able to examine material outside Italy. It is hoped that the following account will assist in the identification of specimens and will draw attention to the gaps in our knowledge. Specimens cited have all been examined except those enclosed in brackets. They are preserved in the Kew Herbarium unless the number is followed by the standard abbreviation for the name of another herbarium (see Lanjouw in Chronica Botanica **5** (1939) 1942). One convention adopted here requires explanation as it is not in general use. In descriptions of new taxa information derived from other than the type specimen is enclosed in square brackets. Thus the statement in the description of *T. purseglovei* ' Pedunculi ad 7 [14] cm. longi ' means that in the type specimen peduncles are up to 7 cm. long, but in other specimens peduncles up to 14 cm. long have been seen. This convention enables two apparently conflicting objects to be conveniently and concisely attained ; namely the need to base the description on the type, which is of great importance should the present concept of the taxon have to be revised, and the need to describe the full range of variation in the taxon, so far as material permits.

My thanks are due to Mr. E. Milne-Redhead for assistance at every stage of the work, to the authorities in charge of the Frankfurt and Paris herbaria for the loan of types, to Prof. W. Robyns for the loan of many Belgian Congo specimens from the Brussels Herbarium and in particular to Prof. R. Pichi-Sermolli for the loan of types and much other material from the Florence Herbarium and for information about several imperfectly known species from Abyssinia described in Italy.

Key to the sections and subsections.

In the main following Taubert in Engler and Prantl Pflanzenfamilien **3** (**3**), 249 (1893). The key is based on the tropical and South African species only.

A. Flowers usually pedicellate ; bracts present (often minute) ; mouth of calyx tube not closed by a circular swelling or ring of hairs ; ovules 2 or more :

Leaves pinnately trifoliate ; calyx 5-nerved ; corolla yellow ; pod 1-seeded by abortion . . . . . 1. *Chronosemium* (sp. 1)

Leaves digitately trifoliate ; calyx usually more than 5-nerved ; corolla purple, white or pink ; pod usually 2 or more seeded :

B. Calyx ± regularly 5-toothed, transverse veins never conspicuous :

C. Bracts 1- or few-nerved, usually much shorter than calyx ; calyx not, or but little, inflated after flowering
2. *Amoria* (spp. 2–30)

Petiole in all leaves united with the stipules for all, or almost all its length; ovules 2 . . . 2a. *Ochreata* (spp. 2–11)

Petiole free for the greater part of its length, at least in the lower leaves :

D. Calyx fewer than 15-nerved (up to 15-nerved in No. 23 but then not inflated and ovules 2) ; ovules 2–9
2b. *Euamoria* (spp. 12–26)

D′. Calyx 15–25 nerved, somewhat inflated in fruit, annuals; heads 1–12-flowered; ovules 3–12
2c. *Loxospermum* (spp. 27–30)

C′. Bracts several-nerved, more than half as long as calyx, forming an involucre; calyx many (25–50) nerved, somewhat inflated after flowering ; ovules ± 4
3. *Mistylus* (spp. 31–33)

B′. Calyx unequally 2-lipped, inflated and conspicuously net-veined after flowering ; ovules 2 . 4. *Galearia* (spp. 34–36)

A′. Flowers sessile, without bracts ; calyx tube pubescent, its mouth constricted by a circular swelling or ring of hairs; ovule 1 (rarely 2)
5. *Eulagopus* (spp. 37–38)

Section 1. CHRONOSEMIUM *Ser.* in DC. Prodr. **2** : 204 (1825)

(1) **T. campestre** *Schreb.* in Sturm Deutsch. Flor. (1804). *T. procumbens* L. (1755 *non* 1753) ; A. Rich. Tent. Fl. Abyss. **1** (1847) 176 ; J. G. Baker in Oliv. Fl. Trop. Afr. **2** (1871) 57 ; E. G. Baker Leg. Trop. Afr. (1926) 76. *T. agrarium* L. sec. Chiov. in Pirotta Fl. Eritrea, Ann. Ist. Bot. Rom. **8** (1908) 84 & 405. (*T. procumbens* L. and *T. agrarium* L. are *nomina confusa* ; see Ascherson & Graebner Syn. Mitteleurop. Flora **6** (1907) 476).

Sudan : (Red Sea Hills) *Andrews* 3520, 3535, *Aylmer* 195A, 592.

Eritrea : *Pappi* 4549 etc.

Abyssinia : (North) *Chiovenda* 1706A FI, *Schimper* (1837) 36 BM (1842) 1899 BM, (1863–8) 213 BM etc.

Habitat : Open sunny spots, 1300–2600 m.

Also in Europe, N. Africa and SW. Asia.

Section 2. AMORIA (*Presl*) *Lojac.* in N. Giorn. Bot. It. **15** (1883) 228 emend. As genus Presl Symb. Bot. **1** (1830) 47.

Subsection 2 A. OCHREATA *Lojac.* l.c. 230.

The members of this subsection are confined to tropical Africa. Their closest affinity seems to be with the S. African *T. africanum* and in

particular with its var. *lydenbergense*. In this connection it is significant that the greatest concentration of species is in the southern part of the range of the subsection.

Key to subsection *Ochreata*.

In using the following key reference should be made to plates 1 and 2.

A. Leaflets rarely more than 5 times as long as wide ; calyx nerves up to 15, usually 11 :

B. Pedicels not reflexed in fruit, shorter than the calyx tube :

C. Leaflets 2–9 mm. long, cuneate-obovate, truncate or emarginate ; inflorescence hemispherical about 15 mm. across
2. *T. cryptopodium*

Calyx nerves fewer than 10 ; standard twice as long as calyx
2α. *cryptopodium*

Calyx nerves 10–11 ; standard not twice as long as calyx
2β. *kilimandscharicum*

C′. Leaflets usually over 9 mm. long ; if shorter, inflorescence oblong :

Leaflets 3 or 4 ; calyx nerves 5 . . . . . 5. *T. mauginianum*

Leaflets 3 ; calyx nerves 10–15, usually 11 :

D. Inflorescence oblong, at least in fruit ; calyx nerves 10–11 :

Leaflets 6–22 mm. long, usually emarginate, truncate or rounded at the apex ; standard up to 7 mm. long ; inflorescence, even in fruit under 18 mm. long, 10–12 mm. across . . . . . 3. *T. usambarense*

Leaflets 12–32 mm. long, usually acute ; standard 7 mm. long or more ; inflorescence rarely under 15 mm. long
4. *T. polystachyum*

E. Inflorescence lax, more than twice as long as broad, 12–15 mm. across ; corolla longer than calyx
4α. *polystachyum*

E′. Inflorescence compact, usually less than twice as long as broad :

Corolla longer than calyx ; leaflets broadly oblanceolate ; inflorescence 15–17 mm. across
4β. *contractum*

Corolla as long as calyx ; leaflets narrowly oblanceolate; inflorescence ± 10 mm. across . 4γ. *psoraleoides*

E″. Inflorescence ± globose, 18–22 mm. across ; calyx nerves 10–15 :

Nerves of leaflets numerous (30–60 on each side) making an angle of over 45° with the midrib ; leaflets oblong-elliptic glabrous, except for a few hairs on the midrib . . . . . 6. *T. somalense*

Nerves relatively sparse (up to 20 on each side) making an angle of less than 45° with the midrib in the lower part of the leaflet :

Leaflets cuneate-obovate, glabrous except for a few hairs on the midrib . . . . . 7. *T. stolzii*

Leaflets lanceolate, very acute, pilose below 8. *T. wentzelianium*

B′. Pedicels reflexed in fruit, those of the upper flowers longer than the calyx tube . . . . . 9. *T. cheranganiense*

A′. Leaflets linear-lanceolate, usually more than 5 times as long as wide ; calyx nerves usually 15–20 ; inflorescence 13–16 mm. across :

Calyx tube and lower leaf surface pilose . . . . 10. *T. ukingense*

Calyx tube and lower leaf surface glabrous . . . . 11. *T. simense*

(2) **T. cryptopodium** *Steud. ex A. Rich.* Tent. Fl. Abyss. 1 (1847) 168 ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 343 & fig. 19.

α. var. **cryptopodium**

Abyssinia (North) : Schimper (1842) 556 (isotype), (1863–8) 1280, *Steudner* 119.

β. var. **kilimandscharicum** (*Taub.*) *Gillett* stat. nov. *T. kilimandscharicum* Taub. in Engler Hochgebirgsflora Trop. Afr. in Abh. Preuss. Akad. Wiss. 1891-2, (1892) 254. *T. cryptopodium* A. Rich. sec. Harms in Engl. Veg. der Erde **9**, Pflanzenwelt Afrikas **3** (**1**) (1915) 568 *pro parte*—Fig. 1/16–18

Uganda-Kenya (Mt. Elgon) : *Liebenberg* 1628, *Thomas* 499, 2631, etc.

Kenya : (Central highlands) *Battiscombe* 1199, *Pierce* 1674, *Dowson* 100, *Edwards* 1652, *Fries* 2265, 2587, etc., (Mt. Kenya) *Bally* 3270.

Tanganyika (Kilimanjaro) : *Meyer* 296 (type of var. β), *Volkens* 955, *Haarer* 700 ; *Geilinger* 4381, *Peter* K6 (O.I.22) etc.

Habitat (of species): Alpine zone, and near water at lower altitudes, 1950–4000 m.

(3) **T. usambarense** *Taub.* in Engl. Pflanzenwelt Ostafrikas **C** (1895) 208

T. polystachyum Fres. sec. J. G. Baker in Oliv. Fl. Trop. Afr. **2** (1871) 58, *pro parte.*

T. pseudocryptopodium Chiov. ex Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 343 & fig. 20 *nomen*—Fig. 1/13–15

Fernando Po : *E. Guinea* 2907.

British Cameroons (Bamenda) : *Maitland* 1391, *Migeod* 332 BM, 452, etc.

Belgian Congo : (Lake Albert) *Lebrun* 3722, (Lake Edward) *Lebrun* 4853, (Virunga Mts.) *Scaetta* 1508, 1525, etc., (Lake Kivu) *Hendrickx* 4425 etc., (Urundi) *Robyns* 2399.

Abyssinia : (South) *Vatova* 833 FI, 1627 FI, 1673 FI (syntypes of *T. pseudocryptopodium*).

Uganda : (Virunga Mts.) *Burtt* 2862, *Purseglove* 709 etc., (Ruwenzori) *Thomas* 688, *Eggeling* 4009 etc., (Elgon) *Thomas* 2537, (Mt. Debasien) *Thomas* 2220.

Kenya : (Central highlands) *Napier* 651, 1240, *Bally* 4655, etc., (Mt. Kenya) *Fries* 1534, *Bally* 370, 384.

Tanganyika : (Bukoba Distr.) *Haarer* 2388, (Mbulu Distr.) *Greenway* 7737 etc., (Central Prov.) *Speke & Grant* s.n., (Mt. Meru) *Burtt* 1737 *Lindeman* 816 etc., (Kilimanjaro) *Johnston* s.n., *Greenway* 3097, *Volkens* 579 (syntype) etc., Usambaras) *Geilinger* 761 etc., (N. of Lake Nyasa) *Emson* 388, *Greenway* 3586, etc.

Intermediate forms occur between this species and *T. cryptopodium* e.g. *Fries* 709, 944, *Edwards* 1813, *Napier* 626.

Habitat and economics. Of all the tropical species this occurs at the lowest altitudes. It seems however to be restricted to the neighbourhood of water except in high rainfall areas. Several collectors refer to it as an important constituent of pastures, well liked by stock. 850–2850 m.

(4 **T. polystachyum** *Fres.* in Flora **22** (1839) 50 ; Lanza Plant. Erythr. Tab. 4 (1910) ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 346 & fig. 22.

α. var. **polystachyum**—Fig. 1/7–9.

Eritrea : *Pappi* 876, *Baldrati* 29 FI, etc.

Abyssinia : North) *Rueppell* s.n. FR (type) *Schimper* (1838) 1071, (1863–8) 1272, *Steudner* 96, etc., (Central) *Dobinson* s.n. BM.

Kenya : (Kitale-Eldoret area) *Harvey* 1376, *Maher* 2065.

β. var. **contractum** *Lanza* l.c. 26 & Tab. 4. *T. contractum* Hochst. in sched.—Fig. 1/1–3.

Eritrea : (*Senni* 191).

Abyssinia : (North) *Schimper* (1853) 808, (1850) (2422 type of var.).

Sudan : (Imatongs) *Thomas* 1851, *Macdonald* 60 BM.

This variety is connected with the typical variety by so many intermediates that it is perhaps hardly worth retaining. The specimens from the Imatongs strongly approach *T. usambarense.*

γ. var. **psoraleoides** *Welw. ex Hiern* Cat. Welw. Afr. Pl. **1** (1896) 205.—Fig. 1/4–6.

Belgian Congo (Katanga) : *Quarré* 6916 BR, s.n. BR.

Angola (Huilla) : *Welwitsch* 1902 (type of var.), *Hundt* 574 BM, 887 BM.

Although the foliage of this variety is that of var. *polystachyum* the inflorescence and flowers greatly resemble those of *T. usambarense* and it might equally well be treated as a variety of the latter species or, perhaps as a distinct third species. Its status in the Katanga is obscure : *Quarré* 6916 is from a dump at Luishia mine where it is probably introduced, the locality for *Quarré* s.n. is given vaguely as Elisabethville only. It is possible that the species may have been introduced here from Angola.

Habitat (of species): Mountain grassland ; moist places at the lower elevations. Var. α 1800–2800 m. ; var. β c. 3000 m. ; var. γ 1500–1700 m.

FIG. 1. Leaf (× 1), leaflet (× 2) and inflorescence (× 1) of :—fig. 1, 2, 3, *Trifolium polystachyum* var. *contractum* (after Schimper 808) ; 4, 5, 6, *T. polystachyum* var. *psoraleoides* (after Welwitsch 1902) ; 7, 8, 9, *T. polystachyum* var. *polystachyum* (after Ruepell s.n.) ; 10, 11, 12, *T. wentzelianum* (after Goetze 825) ; 13, 14, 15, *T. usambarense* (after Thomas 688) ; 16, 17, 18, *T. cryptopodium* var. *kilimandscharicum* (after Leibenberg 1628).

(5) **T. mauginianum** Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 343 & fig. 21.

Abyssinia : (*Ist. Agricolo-Coloniale* s.n. type).

Prof. Pichi-Sermolli states in a letter that the type was destroyed in the war. No data are given concerning locality or habitat. The true status of this plant must remain doubtful for the time being : it may be but an aberrant form of *T. polystachyum*.

(6) **T. somalense** *Taub.* in Ann. Ist. Bot. Rom. **7** (1898) 90, Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 346 & fig. 24.—Fig. 2/8–10

Abyssinia : (South) Bidduma-Alghe 38–39° E. × 5–6° N., Sept. 1893, *Riva* 1301 FI (type) c. 2000 m.

(7) **T. stolzii** *Harms* in Fed. Rep. **14** (1916) 257—Fig. 2/11–13

Abyssinia : Central) Wouramboulchi *Omer Cooper* s.n., Addis Ababa *Dobinson* s.n. BM.

Tanganyika : (North of Lake Nyasa) *Stolz* 1231 (isotype), *St. Clair Thompson* 805, *Pollock* 34, *Emson* 387. 1600–2700 m.

The free portion of the petiole is sometimes quite well developed in this species (e.g. in *Pollock* 34). It thus forms a connecting link between subsections *Ochreata* and *Euamoria*. The Abyssianian plants differ slightly in having a somewhat pilose calyx tube.

(8) **T. wentzelianum** *Harms* in Engl. Bot. Jahrb. **30** (1902) 324—Fig. 1/10–12.

Tanganyika : Livingstone Mountains, 2400 m. *Goetze* 825 (isotype).

(9) **T. cheranganiense** *Gillett* sp. nov.

A *T. stolzii* Harms indumento ubique copiosiore, corolla alba, pedicellis longis, post anthesin reflexis differt.

Herba perennis. *Caules* ad 1 m. longi, pilosi, reprentes, ad nodos interdum radicantes. Stipulae pilosae in toto ad 1·6 cm. longae, parte libera parti petiolum adnatae subaequilonga, viridi, rigida, anguste triangula, ad apicem filiformem sensim attenuata. *Petioli* pars libera pilosa, 1–5 mm. longa vel, e schedula lectoris, inter plantas juniores longior. *Petioluli* pilosi c. 1 mm. longi. *Foliola* supra glabra, infra, praesertim ad costam, pilosa, cuneata vel cuneato-oblonga, apice rotundata vel emarginata, margine serrata, ad 15 mm. longa et 7 mm. lata, nervis principalibus utrinque c. 10, e costa subangulo c. 20 ortis. *Pedunculus* pilosus, 2–5 cm. longus. *Inflorescentia* globosa 2–2·5 cm. diametro, rarius in verticillis duobus vel tribus disjuncta. *Bracteae* minutae albae. *Pedicelli* pilosi, post anthesin reflexi, inferiores c. 1·5 mm. superiores ad 5 mm. longi. *Calyx* pilosus, 11 nervosus, nervo commissurale dorsale duplo, tubo albo 2 mm. longo, dentibus viridibus, subulatis, c. 3 mm. longis. *Corolla* alba ; vexillo elliptico apice rotundato 8–9 mm. longo, 4 mm. lato ; alis 8 mm. longis, lamina auriculata 5·5 mm. longa 1·5 mm. lata ; carina 7 mm. longa, lamina 4 mm. longa. *Stamina* 5–6 mm. longa. *Ovarium* glabrum, 2-ovulatum, 1 mm. longum, 1 mm. stipitatum, stylo 3·5 mm.

FIG. 2. Leaf (× 1), leaflet (× 2) and inflorescence (× 1) of :—fig. 1, 2, 3, *T. simense* (after Ruepell s.n.) ; 4, 5, form of *T. simensis* with long leaflets (after Stolz 2600) ; 6, 7, form of *T. simense* with small leaflets (after Rounce 13) ; 8, 9, 10, *T. somalense* (after Riva 1301) ; 11, 12, 13, *T. stolzii* (after Stolz 1231) ; 14, 15, 16, *T. ukingensis* (after Stolz 2591).

longo. *Legumen* 1–2 spermum, papyraceum, suturis callosis, 3 mm. longum, 1·5 mm. latum. *Semen* ovale, flavum, 1·5 mm. longum, 1 mm. latum.

KENYA : Cherangani Hills, 2100–3000 m., commonest at 2400 m. where it is the chief *Trifolium* species in open grassland in which the original *Themeda triandra* and *Hyparrhenia* species have been superseded by short *Digitaria* species I associated with *T. semipilosum* and, at higher altitudes with other *Trifolium* species including *T. cryptopodium*, 1951, *S. P. Rawlins* 2 (type) :—flowers white, root system a thickened and coarse taproot with relatively few lateral fibrous roots. This specimen was grown from seed by Mr. Rawlins at his farm at a lower altitude than that mentioned above and is certainly an exceptionally luxuriant plant. Another specimen from Sekerr Mt., West Suk, Jan. 1935, *C. A. Thorold* 2759 probably shows a more usual aspect of the species under difficult conditions. It is stunted with leaflets up to 8 mm. long, the free portion of the petiole up to 2 mm. long and the inflorescences 1·7–2 cm. in diameter. It bears a certain resemblance to *T. cryptopodium* and it should be noted that the characters of *T. cheranganiense* seem to be a combination of those of *T. cryptopodium* with those of *T. semipilosum* both of which species occur in its area. Thus a possible hybrid origin for this plant cannot be ruled out. It seems, however, from Mr. Rawlins' excellent and copious notes to behave as a well established species, readily distinguished in the field, of ecological importance locally and of possible economic value.

(10) **T. ukingense** *Harms* in Engl. Bot. Jahrb. **30** (1902) 324—Fig. 2 14–16.

TANGANYIKA : Kyimbila district, N. of Lake Nyasa, Ukinga Mts. 2100–2400 m. (*Goetze* 923 B type), *Stolz* 2591.

Perhaps not specifically distinct from *T. simense*, extreme forms of which it greatly resembles.

(11) **T. simense** Fres. in Flora **22** (1839) 49, Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 346 & fig. 23.—Fig. 2/1–7 & Fig. 3

FERNANDO PO : *Mann* 602.

BRITISH CAMEROONS : (Cameroon Mt.) *Mann* 2018, *Mildbraed* 10862, *Maitland* 915, 1006, etc., (Bamenda) *Keay & Lightbody in FHI* 28466.

BELGIAN CONGO : (Kivu) *Hendricks* 4132, (Urundi) *Lejeune* 332, *Shantz* 756, etc.

ERITREA : *Pappi* 906, 1621, etc.

ABYSSINIA : (North) *Rueppell* s.n. FR (type), *Schimper* (1837) 98, etc., (Central) *Omer Cooper* s.n., *H. Scott* 8, *Wellby* s.n.

SUDAN-UGANDA (Imatongs) : *Myers* 11693, *Eggeling* 5074 EAH.

KENYA : (Elgon) *Lugard* 344, (Central highlands) *Bogdan* 2009, 3192, *Napier* 2202, *Graham* 2549, etc.

TANGANYIKA : (Western Prov. Kasulu) *Rounce* 13 (Mbulu District) *Greenway* 7729, *McKinnon* M 10, (Iringa District) *Davies* 242, *Emson* EB (N. of Lake Nyasa) *Stolz* 1277, 2588, 2600, 2627, etc.

NYASALAND : (Nyika Plateau) *Van der Post* s.n.

FIG. 3. *Trifolium simensis* (after Greenway 7729). 1, flowering branch, × 1 ; 2, leaf, with sheath flattened out, × 2 ; 3, flower, × 3 ; 4, calyx, flattened out, × 4 ; 5, standard petal, × 6 ; 6, wing petal, × 6 ; 7, keel petal, × 6 ; 8, stamens, × 6 ; 9, pistil, × 6 ; 10, fruit, dehiscing, × 6 ; 11, seed, × 6.

This species shows great variation in the width and length of the leaflets.

Habitat : apparently less restricted to moist places than other species in this subsection. Sometimes gregarious in grassland. Miss E. R. Napier observes that it is apparently not very palatable to stock, surviving when other *Trifolium* species were eaten down to ground level. 1500–3000 m.

Subsection 2B. EUAMORIA *Gib. & Belli* in Att. Ac. Sc. Torino **42** : 3 (1887) not of Taubert, including sections *Acaulia* E. G. Baker Leg. Trop. Afr. (1926) 75 and *Calycospata* Chiov. in Ann. Bot. Tom. 9 (1911) 57.

KEY TO SUBSECTION *EUAMORIA* (see plate 4).

A. Peduncle shorter than the inflorescence :

Annual ; stems elongated, ascending ; inflorescence globular, many flowered, terminal ; ovules 2 . . . . 19. *T. pseudostriatum*

Perennial ; stems short, prostrate ; inflorescence 1–5 flowered, axillary ; ovules 2–4, usually 3 . . . . . 15. *T. acaule*

A′. Peduncle longer than inflorescence :

B. Free portion of petiole absent in the upper leaves, in the lower not exceeding 1·5 cm. in length and less than twice as long as leaflets ; ovules 2 :

Pedicels reflexed in fruit, those of the upper flowers usually longer than the pilose calyx tube . . . . . 9. *T. cheranganiense*

Pedicels not reflexed in fruit, shorter than the calyx tube :

Calyx tube glabrous; leaflets cuneate-obovate, widest just below the tips . . . . . 7. *T. stolzii*

Calyx tube pilose; leaflets oblong, elliptic or lanceolate widest at, or just above, the middle . . . . . 12. *T. africanum*

B′. Free portion of petiole often exceeding 1·5 cm. in length, at least in the lower leaves and often more than twice as long as leaflets :

C. Pedicels usually over 2 mm. long, reflexed after flowering ; corolla white or pinkish ; leaflets nearly always pilose, at least on midrib below, ovules 3–6 :

D. Perennial ; peduncle usually 5–10 times as long as leaflets ; calyx teeth 1–2 times as long as tube . 17. *T. semipilosum*

E. Ovary with long hairs near the apex ; leaves pilose below on the midribs and on the lower halves of the two lateral leaflets :

F. Leaflets less than twice as long as wide, orbicular, elliptic ; ovate or rarely obovate, rounded, truncate or slightly emarginate, over 4 mm. long 17α. *semipilosum*

F′. Leaflets 4 mm. long or less . . . 17β. *microphyllum*

F″. Leaflets elliptic or oblong-elliptic, twice as long as wide, over 4 mm. long . . . . . 17γ. *kilimanjaricum*

E′. Ovary glabrous or minutely hispid-punctate; leaflets cuneate obovate, emarginate, glabrescent
17δ. *glabrescens*

D′. Annual; peduncle rarely 5 times as long as leaflets; calyx teeth 2–3 times as long as tube . 18. *T. masaiënse*

C′. Pedicels not reflexed after flowering, corolla purple or crimson, very rarely white :

G. Calyx teeth not more than 1 mm. wide at the base; standard more or less oblong, straight or bent up at the tip, not abruptly narrowed above the middle to an oblong, downwards inflected, tip :

H. Perennials; stem creeping, rooting at the nodes; free portion of petiole always well developed; peduncles usually 5–10 times as long as leaflets; standard 7 mm. long or more :

Inflorescence 1–5-flowered; pedicels up to 4 mm. long; leaflets 2–7 mm. long; ovules 2–4 . 16. *T. petitianum*

Inflorescence usually over 15-flowered; pedicels up to 2 mm. long, leaflets over 7 mm. long, ovules rarely more than 2 :

J. Leaflets elliptic-oblong-oblanceolate or linear, at least twice as long as wide, rarely over 1 cm. wide, often pubescent; free portion of stipules well developed with many parallel nerves; pedicels of lower flowers ± 0·5 mm. long; inflorescence rarely over 2 cm. across; calyx tube ± pubescent; corolla crimson purple . . . . . 12. *T. africanum*

K. Leaflets 2–4 times as long as wide, rounded, truncate or emarginate at the apex :

Leaflets, petioles, peduncles and calyx tube ± pilose
12α. *africanum*

Leaflets, petioles, peduncles and calyx tube ± glabrescent . . . . . 12β. *glabellum*

K′. Leaflets 4–10 times as long as wide, rounded or acute, rarely truncate . . . 12γ. *lydenbergense*

J′. Leaflets usually obcordate not twice as long as wide or if so then inflorescence more than 2 cm. across, glabrous or nearly so; calyx tube ± glabrous; pedicels of lower flowers 1–2 mm. long; corolla bluish purple :

L. Calyx teeth subulate from near their base commissural nerves, other than the dorsal one never splitting low down; carina more deeply coloured than the standard; lamina of ala ± straight, its auricle less than 0·5 mm. long
13. *T. burchellianum*

Standard 8–10 mm. long; inflorescence rarely more than 2 cm. across; leaflets usually under 1 cm. wide; free part of stipules often well developed with many parallel veins . . 13α. *burchellianum*

Standard 10 mm. or more long, inflorescence 2–3 cm. across ; leaflets often over 1 cm. wide ; free part of stipules relatively short and few veined :

Leaflets obcordate, emarginate . 13β. *johnstoni*

Leaflets oblong, obtuse . . . 13γ. *oblongum*

L′. Calyx teeth flat, triangular with scarious margins up to the middle, subulate only above the middle; commissural calyx nerves often dividing low down; standard 8–9 mm. long, as dark as the carina; lamina of ala subfalciform, its auricle over 0·5 mm. long ; inflorescence 16–20 mm. across; free part of stipules short with few weak nerves

14. *T. purseglovei*

H′. Annuals; stems ascending, or, if prostrate rarely rooting at the nodes; free portion of petiole often more or less suppressed in uppermost leaves; peduncles rarely 5 times as long as leaflets ; inflorescence usually more than 15–flowered :

M. Leaves and petioles ± pubescent ; calyx pubescent, 10-nerved, the commissural nerves hardly weaker than the others; ovules 2; pod often 1-seeded and perhaps indehiscent ; pedicel less than 1 mm. long :

Leaflets elliptic-cuneate obovate, not more than twice as long as wide; inflorescence 1·3–2 cm. across; standard ± 8 mm. long; bracts white, not above 1 mm. long . . . . . 20. *T. bilineatum*

Leaflets cuneate-oblanceolate, more than twice as long as wide ; inflorescence 1–1·3 cm. across ; standard 6–7·5 mm. long ; bracts frequently elongated and green, up to 7 mm. long . . 21. *T. pichisermollii*

M′. Leaves and petioles glabrous ; calyx glabrous, or nearly so, usually 11-nerved through doubling of the dorsal commissural nerve, the commissural nerves weaker than the main nerves ; pod dehiscent with strongly thickened callous sutures ; ovules 2–5 :

N. Commissural calyx nerves forking at a wide angle (± 120°) at the base of the sinus ; calyx teeth abruptly narrowed at the base ; standard 3–8 mm. long ; leaflets rarely emarginate, usually strongly toothed :

P. Calyx tube not inflated nor narrowed at the throat, not deeply cleft dorsally at the time of flowering ; stipules entire ; pedicels up to 2 mm. long . . . . . 22. *T. rueppellianum*

Q. Standard 5–8 mm. long :

R. Leaflets oval, oblong or obovate, rounded or truncate :

Ovules 2–3 ; standard longer than calyx

22α. *rueppellianum*

Ovules 3–5 ; standard shorter than calyx
22β. *preussii*

R. Leaflets lanceolate, acute . 22γ. *lanceolatum*

Q′. Standard 3–5 mm. long . 22δ. *minimiflorum*

P′. Calyx tube somewhat inflated, constricted at the throat, often split dorsally half way to base; stipules often laciniate; pedicels ± 0·5 mm. long; ovules 2
23. *T. mattirolianum*

N′. Commissural calyx nerves usually forking at an angle of less than 90° low down the calyx tube; calyx teeth gradually narrowing from the base ; standard 3–4 mm. long; leaflets usually emarginate with numerous small teeth; ovules 2 . . . . 24. *T. baccarinii*

G′. Calyx teeth 1–1·5 mm. wide at base narrowing gradually, with a broad scarious margin; standard widest at the middle then abruptly narrowed to an oblong downwards inflected truncate tip ; inflorescence 3–15-flowered :

Standard 8–10 mm. long; leaflets not twice as long as wide, rarely emarginate ; ovules 4–8 (rarely 2 or 3); usually an annual . . . . . 25. *T. tembense*

Standard over 13 mm. long ; leaflets more than twice as long as wide, usually emarginate ; ovules 7–10 ; usually perennial, rooting at the nodes . . 26. *T. calocephalum*

(12) **T. africanum** *Ser.* in DC. Prodr. **2** (1825) 200, Harvey Flor. Cap. **2** (1862) 159 ; *non* J. G. Baker in Oliv. Fl. Trop. Afr. **2** (1871) 59, *non* E. G. Baker Leg. Trop. Afr. (1926) 80, *non* Fiori N. Giorn. Bot. It. n.s. 55 (1949) 339 *nec* fig. 7 (*T. hirsutum* Thunb. sec. E. Mey. Comm. Pl. Afr. Austr. (1836) 91, *non* Thunb.) (The type of *T. hirsutum* Thunb. in UPS is a species of *Lotononis* according to Harvey). *Lupinaster africanus* (Ser.) Ecklon & Zeyh. Enum. Pl. Afr. Austr. extra Trop. (1836) 223. *T. burchellianum* Ser. var. *africanum* (Ser.) O. Ktze. Rev. Gen. **3** (**2**) (1898) 73.

α. var. **africanum**

Cape Province : (Eastern) *Burchell* 2817 (type), *Cooper* 574, etc.

Orange Free State : *Goossens* 634, *Hutchinson* 2983, *Cooper* 840, etc.

Transvaal : *H. Bolus* 3151, *Rehmann* 6294, *Galpin* 9793, etc.

β. var. **glabellum** (*E. Mey.*) *Harv.* l.c., *T. hirsutum* var. *glabellum* E. Mey. l.c.

Basutoland : *Dieterlen* 6837.

Natal : *Mogg* 788, *Medley Wood* 1097, (*Ecklon and Zeyher* 1508), (*Drege* sn., type of var.).

Transvaal : *Galpin* 9794.

γ. var. **lydenbergense** *Gillett* var. nov. *T. lydenbergense* Harms ms.

Foliola linearia-lanceolata, usque ad 33 mm. longa, 4 mm. lata, apice rotundata vel acuta, superne glabra, infra, praesertim ad nervos sparse

pilosa, vel glabrescentia. *Petioli* pars libera pilosa vel glabra quam pars stipulis adnata saepe multo brevior. *Pedunculus* pilosus. *Calyx* pilosus vel glabrescens.

Transvaal : high veldt, in moist spots, Lydenberg, *Wilms* 288 (type), Carolina, *J. C. Smuts* s.n., Belfast, *Hutchinson* 2740, Pretoria district, *Nelson* 520. Transitional forms occur between this and the other two varieties.

Habitat (of species) : moist grassy places. 600–2000 m.

This species develops a massive rootstock penetrating deeply, it is much grazed by animals and not readily eradicated according to Burtt Davy, Flora of the Transvaal **2** (1932) 404.

T. africanum has been recorded several times from Tropical Africa. Of the specimens cited, those from Abyssinia are *T. pichisermollii*, while Johnston's plant from the Nandi plateau, Kenya, is *T. semipilosum* var. *kilimanjaricum*. There is a scrap in the British Museum labelled 'Kilimanjaro 1917 G. E. Benham' which really is this species but it seems very odd that, if it really does occur on Kilimanjaro, which is a relatively well explored area, it has not been collected on any other occasion. Possibly some error has occurred in the labelling of this specimen.

The relationship between *T. africanum* and *T. burchellianum* is very close. O. Kuntze Rev. Gen. **3** (**2**) : 73, considered that they form one polymorphic species. It seems more probable that two species are concerned between which a large amount of hybridisation has occurred. On this view *T. africanum* var. *glabellum* would be of hybrid origin. It is possible that the large foliaceous many nerved stipules found in most specimens of *T. burchellianum* var. *burchellianum*, especially where its range overlaps with that of *T. africanum*, are the result of introgressive hybridisation. The nomenclatural type of *T. africanum* itself (Burchell 2817) is close to *T. burchellianum* in the shape of its leaflets although the indumentum is strongly developed and this again may well be the result of hybridisation. Specimens of *T. burchellianum* with the crimson flowers of *T. africanum* occur in the area of overlap, e.g. O. Kuntze s.n. from Molteno, eastern Cape Province.

13 **T. burchellianum** *Ser.* in DC. Prodr. **2** (1825) 200, Harvey Fl. Cap. **2** (1862) 159 ; *Lupinaster ecklonianus* Presl Symb. Bot. **1** (1830) 52 Tab. 32. *Lupinaster burchellianus* (Ser.) Ecklon & Zeyh. Enum. Pl. Afr. Austr. extra Trop. (1836) 222. [T. subrotundum J. G. Baker Fl. Tr. Afr. **2** (1871) 59 *pro parte, non* Hochst. & Steud. ex A. Rich.] *T. subrotundum* var. *obcordatum* Welw. ex Hiern Cat. Welw. Afr. Pl. **1** (1896) 205.

α. var. **burchellianum**

Angola (Huilla) : *Welwitsch* 1901, 1901B (type of *T. subrotundum* var. *obcordatum*).

Cape Province (Western) : *Burchell* 516 (type), 6220, *Ecklon* 807 (isotype of *L. ecklonianus*), etc., (Eastern) *Rogers* 28679, *Macowan* 1423, *Smith* 6588, etc.

Basutoland : *Galpin* 6609.

Natal : *Medley Wood* 1833, 2215.

β. var. **johnstonii** (*Oliv.*) *Gillett* stat. nov. *T. johnstonii* Oliv. in Trans. Linn. Soc. Ser. 2 vol. **2** (1887) 331 *non* Edwards Emp. J. Expt. Agr. **3** (1935) etc. *non* Edwards & Bogdan Impt. Grassland Pl. of Kenya (1951) 94 *nec* fig. 33i1, *vix* Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 342 & fig. 11. *T. basileianum* Chiov. in N. Giorn. Bot. It. **36** (1929) 364, *apud* L. A. Savoia Expl. Uebi Scebelli (1932) 398 Tab. 1 fig. 1, Racc. Bot. Min. Consol. Kenya (1935) 29.—Fig. 4/3.

Abyssinia : (source of Webi Shebel) (*Duke of Abruzzi* 112 type of *T. basileianum*), (Galla Sidamo, Koffa), (*Bieber* s.n.), (Area east of Lake Margharita) *Vatova* 661 FI, 717A FI, 791 FI. (Goughé highlands) *H. Scott* 172.

Uganda-Kenya : (Elgon) *Thomas* 2672, *Hedberg* 895 UPS.

Kenya : (Central highlands) *McDonald* 1089, *Bally* 772, *Poulos* 14, 16, *Balbo* 606 FI, etc., (Mt. Kenya) *Armstrong* 3660, *Fries* 750, 1259, etc.

Tanganyika : (Mbulu distr.) *Burtt* 4394, *Lindeman* 845, (Mt. Meru) *Burtt* 4106, *Peter* K 26 (O.I.60), (Kilimanjaro) *Johnston* 114 type of var.) *Volkens* 1842, *Haarer* 701, etc.

The identity of *T. basileianum* is not quite certain. The type was destroyed in the war. *Balbo* 606 was identified by Chiovenda as *T. basileianum* ; it was the usual subglobose inflorescence of var. *johnstonii* while the type of *T. basileianum* is described as " Flores subracemosi in verticillis tribus dispositi ". However individuals in which the inflorescence is rather elongated are known in var. *johnstonii*, e.g. *Armstrong* in Coryndon Museum 3660 and *Miss Napier* 763. Dr. Cufodontis in Sitz. Oest. Akad. Wiss. Math. Nat. Kl. **1** : **156** : 482 (1947) discussing Bieber's plant is also of the opinion that *T. basileianum* is conspecific with *T. johnstoni*.

Occasionally specimens occur with 4 ovules instead of 2, e.g. *Mrs. Brodhurst-Hill* 605 from Kenya. These may represent a result of hybridisation with *T. semipilosum*. All the specimens cited above from S. Abyssinia have 4 ovules and in addition they differ from the type in having the dorsal commissural nerves absent or very weak which often leads to the calyx splitting in the flowering state. The plants described and figured by Fiori (1949) as *T. johnstonii* are still further removed from the type and are here considered under *T. semipilosum* var. *glabrescens*.

The common clover in Kenya usually referred to by D. C. Edwards and other writers on the ecological and economic aspects of the grasslands of that country as *T. johnstonii* seems not to be that species but the (possible related) *T. semipilosum* var. *glabrescens* (see Edwards & Bogdan (1951) 96).

Habitat : apparently a plant of moist forest margins. 1800–4000 m.

γ. var. **oblongum** *Gillett* var. nov.

A var. *johnstonii* caulibus fortioribus ascendentibus, foliolis oblongis, longitudine latitudinem duplo excedente, apice truncatis vel rotundatis, haud emarginatis, petiolisque brevioribus, quam foliolis haud duplo longioribus differt.

This plant becomes very luxuriant ; in the type the stems are 3 mm. thick, the leaflets up to 5 cm. long and the inflorescence 3 cm. across.

Kenya : Cherangani Hills, 2850–3000 m., creeping about in thick

undergrowth, Dec. 1933, *Mrs. Powles* 33 (type of var.) :—purple, up to 30 cm. tall ; Kitale-Elgon district, c. 1950 m., Nov. 1940, *Lady M. Jex-Blake* in *Bally* 1271, Mau, Narok 2850 m., *Bogdan* 2638 (intermediate between the type and var. *johnstonii*).

·14 **T. purseglovei** *Gillett* sp. nov. *T. rueppellianum* Robyns Fl. Spermat. Parc Nat. Alb. **1** (1948) 287 *pro parte* & Tab. 26 *non* Fres.]—Fig. 4,4.

A *T. rueppelliano* Fres. caulibus repentibus nodis radicantibus, pedunculis longioribus, foliolis obcordatis emarginatis, corolla maiore differt. A *T. burchelliano* Ser. ut in clave suprea differt.

Herba perennis, apice pedunculi excepta, glabra. *Caules* infra repentes ad nodos radicantes, superne ascendentes. *Stipulae* ad 1 [1·5] cm. longae parte libera, quam parte petiolo adnata duplo breviore, late triangulare, acuminata, sparse reticulato-nervosa. Petioli ad 4 [6] cm. longi. *Foliola* ad 1 mm. petiolulata, elliptico-oblonga, basi late cuneata, apice obcordata, retusa vel rarius truncata, margine serrata, dentibus ± acutis sed vix acuminatis, ad 1·4 [1·7] cm. longa, 1·0 [1·2] cm. lata ; nervis utrinque 8–9, tenuibus, sparsis, e costa sub angulo c. 45° ortis. *Pedunculi* ad 7 [14] cm. longi, sulcati, glabri vel superne sparse et breviter pilosi. *Inflorescentia* semiglobosa, 20–30-flora, 16–18–20 mm. lata, c. 12 mm. longa. *Bractea* papyracea oblonga c. 1 mm. longa et lata. *Pedicelli* ad 2 mm. longi, post anthesin haud reflexi. *Calyx* 11–13 nervosus, nervo commissurali dorsali ut videtur semper gemino, 1–2, aliis vel geminis vel plus minusve finis ; tubo 2 mm. longo ; dentibus 2–3 mm. longis ad mediam triangularibus margineque scariosis, superne subulatis. *Corolla* concolor, in vivo " rubra purpurea " in sicco cyano-purpurea. *Vexillum* oblongum, apice rotundatum, emarginatum, 8 mm. longum, 4 mm. latum. *Ala* 7·7 mm. longa, lamina oblongo-subfalciforme 5·5 mm. longa (auriculo 0·6 mm. longo incluso) 1·4 mm. lata, ungue 2·6 mm. longo. *Carina* 6·2 mm. longa, lamina 3 mm. longa inclusa. *Stamina* 5–6 mm. longa, filamentis apice dilatatis, antheris 0·3 mm. longis. *Ovarium* 2·3 mm. longum, 2-, rarius 3- [rarissime 4-] ovulatum, brevissime puberulum. *Stylus* 3·7 mm. longus. *Legumen* 2- rarius 3-spermum, oblongum, complanatum, ad 5·5 mm. longum, 2 mm. latum, papyraceum et translucens suturis rigidis excepto. *Semen* laeve, brunneum, complanatum, 1·6 mm. longum 1·1 mm. latum.

Belgian Congo-Uganda border. Volcanic region between lakes Edward and Kivu from 29° 29′ 50″ E. and 1° 10′ 1° 40′ S. Kachwekano farm, Kigezi, 1950 m., swamp, Dec. 1949, *J. H. Purseglove* 3139 (type) :—flowers reddish-purple, vernac. name (Lukiga) 'Erondo' ; Bufundi, Kigezi, 1950 m., stream side, July 1946, *Purseglove* 2103 :—partially procumbent, flowers purple ; Mt. Sabinyo, Kigezi, 2250 m., mountain grassland, June 1949, *Purseglove* 2923 :—procumbent, flowers deep purple ; Mushogiri near N. of Lake Mutanda, Kigezi, 1860 m., dense moist grass near lake, 8 Jan. 1933, *C. G. Rogers and H. M. Gardner* 300 :—flowers mauve ; between Mt. Mikeno and Mushumangabo, 1650–1850 m., Aug. 1937, *J. Louis* 4965 :—flowers forming a carpet, violet ; Sabinio volcano, 2250 m., short-grassed glade by stream in forest below bamboo zone, local, 12 Dec. 1930, *B. D. Burtt* 2980 :—flowers lilac ; Kikomero, 1850 m., Nov. 1937, *J. Lebrun* 8472 :—flowers bright violet ;

near Kibati south of Mt. Ninagongo, c. 1900 m., 16 Febr. 1927, *D. H. Linder* 2104 ; between Kikumba and Vyamuragira, 1800–2000 m., forming a carpet beside a path in sclerophyllous forest on lava plain. Aug. 1937, *J. Lebrun* 7070 :—flowers reddish-violet ; Kassale near Mokoto lakes 1900 m., *Claessens* s.n. BR ; Lake Bolera near Ruhengeri. 1900 m., Dec. 1932, *Becquet* 183 BR ; Mt. Mikeno, southern slopes. 2800 m., small marsh in *Hagenia* association, *Lebrun* 7326 BR :—prostrate rooting herb forming a carpet, flowers violet.

This species is named after Mr. J. W. Purseglove whose collections have greatly added to our knowledge of the flora of South-west Uganda. In the past it has been confused with *T. tembense* Fres., which grows at higher altitudes (2700 3200 m.) in the same area, as well as with *T. burchellianum* Ser. and *T. rueppellianum* Fres. It shows a greater resemblance to *T. burchellianum* var. *burchellianum*, in particular to the form found in Angola (*Welwitsch* 1901) than to var. *johnstonii*.

It is noteworthy that *T. purseglovei* like several other species occurring in the Virunga mountains (*T. tembense*, *T. multinerve*, *T. simense* and *T. rueppellianum*) has not yet been found on Ruwenzori. The explanation may well lie in a higher phosphorus content of the much newer volcanic soils of the former area.

(15) **T. acaule** *Steud. ex A. Rich.* Tent. Fl. Abyss. **1** (1847) 169 including var. *emarginatum* Chiov. ex Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 343, & fig. 17

Abyssinia : (North) *Schimper* (1842) 587 (isotype), *Vatova* 2460 FI (type of var. *emarginatum*) ; (Central) *Hugh Scott* s.n. and 18.

Uganda-Kenya : (Elgon) *Dummer* 3309, *Thomas* 599, *Lugard* 329, *Hedberg* 995 UPS.

Fiori (1949) fig. 17 represents var. *emarginatum* and not the typical plant.

2900–4000 m.

(16) **T. petitianum** *A. Rich.* Tent. Fl. Abyss. **1** (1847) 168; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 18; including var. *cuneatum* E. G. Baker, Leg. Trop. Afr. (1926) 78. *Trigonella caespitosa* Steud. in sched. Pl. Schimp. Ab. 2 no. 1389 *nomen.*

Eritrea : *Pappi* 1084 (also numbered 336) (type of var. *cuneatum*).

Abyssinia : (North) *Petit* s.n. and *Schimper* (1838) 1389 (syntypes) *Schimper* (1853) 117, 924, *Schimper* (1863–8) 320.

Schimper 1389 is a plant with minute, deeply emarginate leaflets wider than they are long, long petioles and peduncles and small flowers (standard 6–7 mm. long). The remaining specimens and *T. acaule* var. *emarginatum* form a series connecting this plant with typical *T. acaule*. The characters mentioned seem to vary independently of one another. It must be left to future research, based on a much greater quantity of material, to decide whether there are here two species hybridising or one very variable species.

E. G. Baker placed *T. acaule* and *T. petitianum* in a new subsection *Acaulia*. However since both species frequently produce long creeping

stems the name is misleading and worthless as a distinguishing character while the other separating feature (the small number of flowers in the inflorescence) seems hardly sufficient.

(17) **T. semipilosum** *Fres.* in Flora **22** (1839) 52. Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 9 & 10—Fig. 4/8.

α. var. **semipilosum** (incl. var. *sennii* Chiov. ex Fiori l.c. 342).

Southern Arabia : *Schweinfurth* 1384.

Eritrea : *Schweinfurth and Riva* 1288.

Abyssinia : (North) *Rueppell* s.n., FR (type), *Schimper* (1838) 1174, *Petit* s.n., (Central) *Omer Cooper* s.n., *Senni* 1235 FI (type of var. *sennii*), (East-Harar) *Wellby* s.n., *Gillett* 5112, (South) *Cufodontis* 635.

Kenya : Mt. Kulal *Bally* 5540, (Central highlands) *Edwards* 2996, *Gethin Jones* 1944, *Napier* 674, etc., (Mt. Kenya area) *Van Someren* 1733, *Fries* 164, (Chyulu Hills) *Bally* 8236.

Tanganyika : (Mbulu District) *Greenway* 6793, *Staples* 295, *Burtt* 4297, etc., (Arusha District) *St. Clair Thompson* 1245, (Kilimanjaro) *Haarer* 350, *Rogers* 418, *Greenway* 3910, 6734.

Habitat : open grassland in relatively dry situations as compared to other spp., 1500–2700 m.

This is a variable plant. Fresenius' type itself consists of three gatherings which show considerable differences in leaflet shape and size.

β. var. **microphyllum** *Chiov.* in Ann. Ist. Bot. Rom. **8** (1908) 406.

Eritrea : *Pappi* 1132 (type of var.).

Kenya : (Elgon) *Lugard* 351.

Tanganyika : (Masai Distr.) *Burtt* 4385.

2500–3000 m.

It is doubtful whether this is really anything but a form of var. α, *semipilosum*.

γ. var. **kilimanjaricum** *E. G. Baker* Leg. Trop. Afr. (1926) 81.

Abyssinia : (Central) *Hugh Scott* s.n.

Kenya : (Central highlands) *Johnston* s.n., *Brodhurst Hill* 629, *Edwards* 1817, etc., (Mt. Kenya) *Fries* 581, (Chyulu Hills) *Bally* 8238.

Tanganyika : (Mbulu District—Masai steppe) *Fosbrooke* 26, *Greenway* 7462, *Peter* 43242, (Kilimanjaro) *Haarer* 1788, *Volkens* 267 (type of var.)

1500–2800 m.

While this variety appears very distinct at first sight, numerous intermediates connect it with var. α.

δ. var. **glabrescens** *Gillett* var. nov. [*T. repens* E. G. Baker Leg. Trop. Afr. (1926) 81 non L.] [*T. johnstoni* D. C. Edwards Emp. J. Expt. Agr. **3** : (1935) etc., Edwards & Bogdan Impt. Grassland Pl. Kenya 94 & fig. 33 : 1 *non* Oliv.].

A var. *semipiloso* ovario glabro, foliolis cuneato-obovatis emarginatis plus minusve glabrescentibus differt.

This variety approaches certain forms of *T. repens* L. However, the more pilose plants show the characteristic indumentum of *T. semipilosum* and clear traces of this remain even in more glabrescent individuals. It might seem possible that this variety represents the result of hybridisation between *T. semipilosum* and introduced *T. repens*. Mr. D. C. Edwards informs me that several attempts have been made to introduce the latter species to the Kenya uplands but that on each occasion it has dried out rapidly. However, our older specimens of var. *glabrescens* date from the earliest days of European penetration into the Kenya highlands. Thus Scott Elliot 6606 was collected in 1893, 6 years before the railway reached Nairobi and it is unlikely that a European fodder plant should have been introduced as early as this. It is worthy of note that var. *glabrescens* exists where the ranges of *T. semipilosum* and *T. burchellianum* var. *johnstonii* overlap. All the characters in which var. *glabrescens* differs from var. *semipilosum* are found in *T. burchellianum* var. *johnstonii*. It would thus appear probable that var. *glabrescens* may be the result of hybridisation between *T. semipilosum* and *T. burchellianum* var. *johnstonii*.

The large number of different strains of this variety which have been recognised by agriculturalists in Kenya is consistent with its probable hybrid origin.

Uganda : (Kampala) *Maitland* 654 (perhaps introduced).

Kenya : (South Kavironda District) *Greenway* 7871 (type of var.), (Central highlands) *Powell* 15, *McDonald* 991, *Hobbs* 611, 612, 613, etc., (Mt. Kenya area) *Shantz* 861, (Nairobi area) *Napier* 455, *Lyne Watt* 1191, *Scott Elliott* 6606, etc.

Tanganyika : (Biharamulo Distr.) *Rounce* 232 EAH. (Musoma near Lake Victoria) *Kirby* s.n., *Emson* 273.

Habitat : apparently in moister areas than var. α, 1500–2000 m.

Vatova 33 FI and 717 FI from the highlands east of Lake Margharita, S. Abyssinia 2700–3000 m. are the types of *T. brunellii* Chiov. ex Firoi (1949) 342 & fig. 12 (*nomen subnudum*). This plant differs from *T. semipilosum* var. *glabrescens* in the small number (6–13) of flowers in the inflorescence, the larger flowers (standard ± 12 mm. long) and in the leaves being pubescent all over both surfaces. The difference is bridged to a great extent by three specimens from above Debrasma, 140 km. NE. of Addis Ababa 3000 m., *Senni* 895 FI, 956 FI and 1954 FI which Fiori (1949) 342 & fig. 11 described as *T. johnstonii*. These have a much sparser indumentum, particularly on the upper leaf surface, which is almost glabrous. On the whole it seems better to leave the status of these Abyssianian plants undefined, as intermediates of possible hybrid origin between *T. semipilosum* and *T. burchellianum*, without giving them any specific or varietal name, until much more material is available. It will be noticed that there appears to be an uncommonly large proportion of intermediates of probable hybrid origin between *T. semipilosum* and *T. burchellianum* both in Kenya and Abyssinia. This may well be explained by the fact that the former is a plant of dry open places in the forest zone and the latter of moister forest openings, especially at the upper edge of the forest. The destruction of forests by man must have enormously increased the number of open sunny places in areas of a forest climate which would be colonisable by both species and in which hybridisation, if possible, might be expected to occur.

All forms of *T. semipilosum* appear to be useful fodder plants but var. *glabrescens* seems to be the most valuable. It is the most important leguminous fodder in the Kikuyu grass (*Pennisetum clandestinum*) pastures of the Kenya uplands.

(18) **T. masaiënse** *Gillett* sp. nov.—Fig. 4/7.

A *T. semipiloso* Fres. habitu annuo, foliolis validius dentatis, lamina foliolorum epilosa, calycis dentibus tubo 2–3 plo longioribus differt. A *T. hybrido* L. et *T. balansae* Boiss. calycis dentibus majoribus, calyce, pedicellis, petiolisque pilosis differt.

Herba annua. *Caules* ad 40–60 cm. ascendentes, glabrescentes. *Folia* ad stipulas, petiolos costasque inferne pilis longis albidis sparse obtecta, aliter glabra; stipulae sparse et pauce nervosae, parte adnata c. 7 mm. longa, parte libera acuminata c. 7 mm. longa; petiolus ad 5 cm. longus, foliola ovato-elliptica, basin cuneata, apice rotundata, valide serrato dentata, utrinque c. 14-nervosa, ad 18–29 mm. longa, ad 10 [14] mm. lata. *Inflorescentiae* multae globosae umbellatae c. 20–florae, pedunculis plus minusve pilosis 5–8 cm. longis, pedicellis pilosis, post anthesin reflexis ad c. 6 mm. elongatis, bracteis minimis. *Calyx* 10–11 nervosus sparse pilosus, pilis ad 1·5 mm. longis, tubo c. 2 mm. longo, dentibus duo superioribus c. 5 mm. longis, lateralibus 4·5 mm. longis, inferiore 4 mm. longo. *Corolla* ["pallide rosea"] in sicco brunnea. *Vexillum* 10 mm. longum, 4·5 mm. latum. *Alarum* unguis 3 mm. longo, lamina (auricula, 1 mm. longa inclusa) 5·5 mm. longa. *Carina* 7 mm. longa. *Stamina* 5–6 mm. longa. *Ovarium* glabrum, 4-ovulatum, stylo 3 mm. longo. *Legumen* 4-spermum 5·5 mm. longum, papyraceum, margine valide incrassatum.

Tanganyika Territory: Musoma District and Masai District, Serengeti plains, Moru, moister parts, 1200 m., June 1932, *H. E. Hornby* H40, 32/16 type, June 1933, *H. E. Emson* 310:—Pinkish white flowers, up to 60 cm. tall, pure stands found in certain parts are much sought after by the Masai; same area, Ngare Nanyuki, March 1937, *Mrs. A. Moore* 44:—pale yellow flower head, not very common; Ngorongoro Crater, 1500 m. Sept. 1927, *A. E. Haarer* 608, 609; same area, Laroda, 1800 m. Sept. 1932, *B. D. Burtt* 4191:—trailing, pale pink flowers, very common in certain areas; same area, 23 & 24 July 1926, *A. Peter* 43147, 43202:—flowers pink; same area, Siedentopf's, Apr. 1941, *Bally* 2259; steppe behind Arusha, 1700 m., Sept. 1913; *Dr. Limming* 5755.

(19) **T. pseudostriatum** E. G. Baker Leg. Trop. Afr. (1926) 83.
T. scaettae Staner in Rev. Zool. Bot. Afr. **23** (1933) 217, *nomen.*

East Belgian Congo: (Lake Albert) *Claessens* (Lakes Edward & Kivu) *Lebrun* 9140, *Linder* 2010, *Scaetta* 1293 BR (type of *T. scaettae*) etc., (Ruanda-Urundi) *Lejeune* 329, *Becquet* 302, etc.

South-west Uganda: *Bagshawe* 413 BM (type), *Snowden* 1652, etc.

Tanganyika: (Western Province, Kasulu) *Rounce*, 1 (Ufipa plateau) *Michelmore* 1038, (Southern highlands) *Staples* 423, *Davies* 458, 585, M8.

Northern Nyasaland: Agric. Dept. 2.

Habitat: pastures in high rainfall areas, 1350–2200 m.

Rounce 1 is an abnormal form in which some of the inflorescences are pedunculate.

This species is here placed in *Euamoria* rather than in *Eulagopus* (where E. G. Baker placed it) because the whole plant is almost glabrous, bracts and pedicels up to 1 mm. long are present, the calyx has 11 nerves and splits dorsally in the fruiting stage and has no thickening or ring of hairs at the throat, and the fruit is 2-seeded, dehiscent, with a strongly thickened suture. Taken together these characters seem to outweigh the sessile inflorescence and the rather long claws of the alae. The stipules are entire, not bifid as stated by Baker.

(20) **T. bilineatum** *Fres.* in Flora **22** (1839) 52. Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 8. *T. costatum* Hochst. ex Engl. Hochgebergiflora Trop. Afr. (1892) 252.

Eritrea : *Baldrati* 4248 FI.

Abyssinia : (North) *Rueppell* s.n. FR (type), *Schimper* (1863–8) 1264, *Plowden* s.n., *Massey* 64.

(21) **T. pichisermollii** *Gillett* sp. nov. [*T. africanum* J. G. Baker in Oliv. Fl. Trop. Afr. **2** (1871) 59 *pro parte*, E. G. Baker Leg. Trop. Afr. (1926) 80 *pro parte*. Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 337 & fig. 7 *non* Ser.].

A *T. bilineato* Fres. foliolis angustioribus, floribus minoribus, bracteis saepius multo majoribus differt. A *T. africano* Ser. habitu annuo, stipulis crebris brevioribus paucinervosis, foliolis validius serratis, pedunculis brevioribus, bracteis saepius majoribus, calyce 10-non 11-nervoso, legumine margine vix incrassato differt.

Herba annua, omnino pilosa. *Caules* ad 25 cm. ascendentes. *Stipulae* ovato-acuminatae c. 3-nervosae, parte adnata ad 5 mm. longa, parte libera ad 6 mm. longa. *Petioli* inferiores ad 3 cm., superiores c. 0·5 cm. longi. *Foliola* c. 0·5 mm. petiolulata, oblanceolata, valde serrata dentibus acuminatis, utrinque c. 9 nervosa, apice rotundata vel acuta, infra anguste cuneata, ad 19 mm. longa, 7 mm. lata, costa foliolorum lateralium saepius excentrica. *Pedunculi* ad 4 cm. longi. *Inflorescentia* semiglobosa, c. 12 mm. lata, 7 mm. longa, c. 20-flora, floribus omnibus bracteatis. *Bracteae* virides, saepe 2–3 dentatae, 5–7 mm. longae, 1·3 mm. latae, 1–3-nervosae [bracteae plantarum minorum interdum vel minutae]. *Pedicelli* ad 1 mm. longi, post anthesin haud reflexi. *Calyx* supra dense fervugineo pilosus, valide 10-nervosus, nervis commissuralibus quam aliis haud tenuioribus, tubus c. 2·5 mm. longus, dentes in sicco atrovirides 2–2·5 mm. longi, basin triangularii margine incrassati apice subulati. *Corolla* purpurea. *Vexillum* [6·5]–7·5 mm. longum, 2 mm. latum, apice attenuatum denticulatum. *Alae* 5·5 mm. longae, lamina 3 mm. longa inclusa. *Carina* 5 mm. longa, lamina 2 mm. longa inclusa. *Stamina* 3–4 mm. longa. [*Ovarium* glaber 1 mm. longum, 2-ovulatum]. *Stylus* 2·5 mm. longus. *Legumen* glaber 2- vel abortu 1-spermum, 2 mm. longum, 1·5 mm. latum papyraceum, margine haud vel paulo incrassatum, seminis complanatis brunneis c. 1·5 mm. diametro.

Central Abyssinia : Scioa : Ambossa c. 2300 m., 15 Apr. 1909, *Dr. G. Negri* 85 bis, FI (type) ; Bole (Addis Abeba), 20 June 1939, *Dr. Baldi*

9 FI ; Maresia, 4 Sept. 1885, *Dr. V. Ragazzi* s.n. FI ; *Dr. Roth* s.n. ; Mbulu 32 km. N. of Addis Abeba, 2400 m., 20 Jan. 1944, *Bally* 3070.

This species is much more closely related to *T. bilineatum* than to *T. africanum*, in spite of a superficial resemblance to the latter species. The large bracts when normally developed provide a striking difference from both the other species, but are absent in *Ragazzi* s.n. and *Bally* 3070, which both show only two inflorescences, and are visible in only 2 of the 4 somewhat damaged inflorescences in *Roth* s.n.

Both *T. bilineatum* and *T. pichisermollii* show an affinity to section *Eulagopus*. The flowers are almost sessile, the sutures of the fruit seem to be hardly thickened, the calyx is densely pubescent with some hairs in the throat and its 10 nerves are all of the same thickness instead of the commissural nerves being weaker than the others or the dorsal commissural nerve divided as is usual in *Euamoria*. It would however require a new conception of the section if a species with well developed bracts such as *T. pichisermollii* were to be placed in *Eulagopus*.

22 **T. rueppellianum** *Fres.* in Flora **22** (1839) 51. Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 6. *T. subrotundum* Hochst. & Steud. ex A. Rich. Tent. Fl. Abyss. **1** (1847) 172 *pro parte* (excluding the variety and *Trigonella marginata* Hochst. & Steud. in sched.). Edwards and Bogdan Important Grassland Plants of Kenya (1951) 97 & fig. 33 : 2.—Fig. 4/2, 6

α. var. **rueppellianum.**

Belgian Congo : (Virunga Mts.) *Lebrun* 8792 BR *Hendrickx* 462 *pro parte* BR, *Scaetta* 166 *pro parte* BR.

Eritrea : *Pappi* 871.

Abyssinia : (North) *Rueppell* s.n. FR (type), *Schimper* (1837) 303, (type of *T. subrotundum*), *Schimper* (1863–8) 51, 420, 1276, *Steudner* 123, *Dillon and Petit* s.n. ; (Central) *Omer Cooper* s.n., *Wellby* s.n., *Roth* 173.

Uganda : (Mt. Debasien) *Eggeling* 2689.

Kenya : (Elgon) *Lugard* 485, *Hedberg* 24, 266A, (Central highlands) *Harvey* 1377, *Napier* 714, *Ford* s.n.

1800–3450 m.

β. var. **preussii** (*Taub. ex E. G. Baker*) *Gillett* stat. nov. *T. preussii* Taub. ex E. G. Baker Leg. Trop. Afr. 1926) 82. *T. subrotundum* Hochst. & Steud. sec J. G. Baker in Oliv. Fl. Trop. Afr. 2 (1871) 59 *pro parte*.

Fernando Po : *Mann* 603.

Cameroon Mt. : *Preuss* 972 (type of var.), *Migeod* 203.

Sudan : (Imatongs) *Thomas* 1655.

Kenya : (Central highlands) *Bogdan* 1001, 1920.

Tanganyika : (Northern Province) *Haarer* 313, *Bally* 2259A.

1500–2700 m.

E. G. Baker's statement that the stipules are bifid is incorrect. Taubert first named *Preuss* 972 *T. presussii* in manuscript and a duplicate so named reached Kew in 1894. This must have been seen by E. G.

Baker when he took up the name in 1926, although he does not there cite the specimen but only *Mann* 603. Later (page 877) he states that *Preuss* 972 is the type. Meanwhile, in Engl. Bot. Jahrb. **23** (1896) 130, Taubert had published a revised opinion on *Preuss* 972 identifying it as *T. goetzenii* Taub. ex Engler. In so doing he was presumably influenced by the number of ovules but took no account of the size of the standard which is described as 9 mm. long in *Goetzen* 95 and is only 5–6 mm. long in *Preuss* 972.

Although the distinction between the Abyssinian plants with 2 ovules and the standard definitely larger than the calyx (var. *rueppellianum*) and the West African var. *preussii* with its 3–5 ovules and the calyx longer than the corolla is clear when the plants of these two areas alone are considered, in East Africa, besides examples of both varieties, a greater number of plants occur in which these characters are confused. Such are

Kenya : (Elgon) *Tweedie* 598, *Maher* 2064, (Central highlands) *Linton* 74, *Brodhurst Hill* 603, (Chyulu Hills) *Bally* 8237.

Tanganyika : (Mbulu District) *Staples* 417, *B. D. Burtt* 4180, (Kilimanjaro) *Sanders* H 22/30, *Johnston* 77, *Volkens* 871, (Iringa District) *Davies* L 41, *Staples* 422 (N. of Lake Nyasa) *Stolz* 721.

1500–2850 m.

γ. var. **lanceolatum** *Gillett* var. nov.

A varietatibus aliis foliolis lanceolatis acutis, calyceque pilosiore differt. *Corolla* c. 5 mm. longa, calyce subbrevior. *Ovarium* biovulatum.

Kenya : Rift Valley Prov., Molo, 2800 m., July 1931, *Edwards* 1808 (type), less creeping than some clovers, isolated plants in Kikuyu grass pastures ; same locality, July 1951, roadside grassland, *Bogdan* 3175, common ; weed in experimental green plots, *Bogdan* 3178 ; same locality, Sept. 1911, *W. M. Tod* s.n. ; Kinangop plateau near Karati river, 2500 m., in rocky pastures, Nov. 1933 *Mrs. Albrechtsen* 6052, flowers purple.

δ. var. **minimiflorum** *Gillett* var. nov.

A varietatibus aliis floribus minimis, vexillo c. 3·5 mm. longo differt. *Foliola* obovata basi cuneata valide dentata apice rotundata ad 10 mm. longa, 5 mm. lata. *Pedunculi* superne, pedicelli que, dense pilosi vexillum calyce subaequilongum. *Ovarium* c. 3-ovulatum.

Tanganyika : Kilimanjaro area, Mashami, 1500 m., Aug. 1927, *Haarer* 353 (type), flowers purple ; same locality, Aug. 1925, *Haarer* 11/20/34 (1) ; Sept. 1927, *Haarer* 351A ; Aug. 1927, *Haarer* 354, flowers white ;between Umbwe and Weru Weru rivers, 1400–1500 m., Sept. 1932, *Greenway* 3239A, flowers white.

The small size of the flowers suggests *T. baccarinii*, which grows in the same area. *Greenway* 3239 and *Haarer* 351 are mixed gatherings of this plant and *T. baccarinii*. However all other characters (calyx nerves and teeth, shape and teeth of leaflets) are as in *T. rueppellianum*. *T. rueppellianum* is apparently a useful fodder species. Maher (1936) states that it seems to be palatable to elephants on Mt. Elgon.

(23) **T. mattirolianum** *Chiov.* in Ann. Bot. Rom. **9** (1911) 57 ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 5.

Abyssinia : (Gondar) *Chiovenda* 1422 FI (type), 1706 FI.

Chiovenda's specimens consist of a large number of small plants which are by no means uniform. His description seems to be based on certain plants in No. 1422 which have entire stipules and in which the inflation and splitting of the calyx is unusually pronounced. Other plants have laciniate stipules and there seems little doubt that these represent the *T. subrotundum var.* α *stipulis incisis* of Richard, of which however I have seen no specimen. There also seems no doubt that they are conspecifiv with the individuals which Chiovenda describes, although not identical. This species looks different from *T. rueppellianum* on account of its small size, slender petioles, etc., but the key characters which separate it are unsatisfactory and further research may show it to be but a form of *T. rueppellianum* as Richard thought. Chiovenda attached great importance to the dorsal splitting of the calyx, making this species on that account the type of a new subsection *Calycospatha*. However this splitting, which seems to be due to the asymmetrical inflation of the calyx does not always occur, and in any case is commonly found in related species at a later stage in development when the fruit is ripening.

(24) **T. baccarinii** *Chiov.* in Ann. Bot. Rom. 9 (1911) 57 ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 4. *Trigonella marginata* Hochst. & Steud. in Sched. Pl. Schimp. Ab. 1 no. 64 (*nomen*). *T. subrotundum* A. Rich. Tent. Fl. Abyss. **1** (1847) 172 *pro parte, non* Hochst. & Steud. [*T. rueppellianum* Chev. in Rev. Bot. Appl. **14** (1934) 439 *non* Fres.] *T. rueppellianum* f. *minor* Chev. l.c. 440—Fig. 4/1.

British Cameroons : (Bamenda) *Keay and Russell in F.H.I.* 28449.

French Cameroons : (c. 7°N. × 12° E.) *J. Prenent* 18 P, *J. Prenent* s.n. P (type of *T. rueppellianum* f. *minor*).

Belgian Congo : (West of Lake Albert) *Taton* 366 BR, 371 BR, 452 BR, *Kesler* 26 BR, (between Lakes Edward and Kivu) *Bequaert* 5849 BR, (West of Lake Kivu) *Scaetta* 692 BR, 1294 BR, *Hendrickx* 4429.

Abyssinia : (North) *Schimper* (1837) 64, *Chiovenda* 1774 FI (type), 2010 FI, 2155 FI.

Uganda : (South-west) *Thomas* 1418, *Hazel* 46, (North-east) *Chandler* 491, *Snowden* 415, *Maitland* 1253, *Thomas* 308, 2535.

Kenya : (Kitale) *Halcrow* 3137.

Tanganyika : (Kasulu) *Rounce* 11, (Kilimanjaro) *Haarer* 351 B, *Greenway* 3239 B, (Southern highlands) *Stolz* 721A.

Habitat : pastures in fairly heavy rainfall areas, 1200–2100 m.

T. baccarinii only seems to adopt the prostrate habit in open overgrazed conditions. It appears to be an annual as a rule but in eastern Uganda a form occurs (*Thomas* 308) which sometimes roots at the nodes and may be perennial. This is said to be a common and valuable component of heavily grazed pastures at c. 1500 m.

(25) **T. tembense** *Fres.* in Flora **22** (1839) 51 ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 3. *T. umbellulatum* A. Rich. Tent. Fl. Abyss. **1** (1847) 172. *T. goetzenii* Taub. ex Engl. in von Goetzen

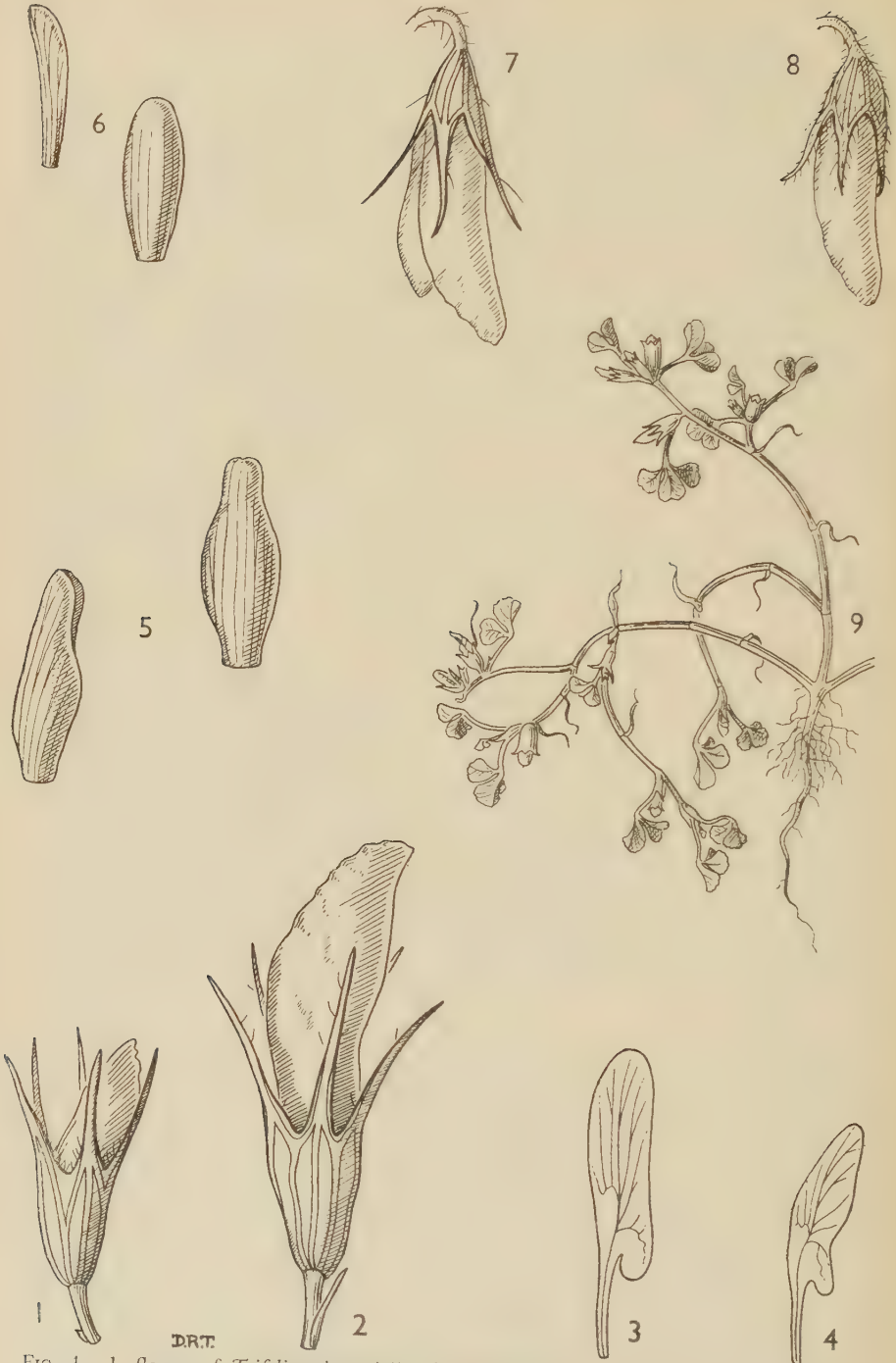

FIG. 4. 1, flower of *Trifolium baccarinii* (after Schimper 64), × 8 ; 2, flower of *T. rueppellianum* (after Schimper 303), × 8 ; 3, wing petal of *T. burchellianum* (after Napier 763), × 4 ; 4, wing petal of *T. purseglovei* (after Purseglove 3139), × 4 ; 5, side and back view of standard petal of *T. tembense* (after Burtt 2856), × 3 ; 6, side and back view of standard petal of *T. rueppellianum* (after Pappi 871), × 3 ; 7, flower of *T. masaiënse* (after Hornby H140/32/16), × 4 ; 8, flower of *T. semipilosum* (after Napier 674), × 4 ; 9, part of plant of *T. elgonense* (after Hedberg 266), × 1.

Durch Afrika von Ost nach West (1895) 376–8. *T. calocephalum* var. *parviflorum* Chiov. in Ann. Ist. Bot. Rom. **8** (1908) 405. [*T. subrotundum* Harms in Engl. Pflanzenwelt Afrikas **3** (**1**) (1915) 568 *pro parte, non* Hochst. & Steud. ex A. Rich.] [*T. rueppellianum* Robyns Fl. Spermat. Parc. Nat. Alb. **1** (1948) 287 *pro parte, non* Fres.]—Fig. 4/5

Belgian Congo–Uganda : (Virunga Mts.) *B. D. Burtt* 2856, 3050, *De Witte* 1698, *Scaetta* 1567, *Lebrun* 9338, *Linder* 2356, (*Von Goetzen* 95 B, type of *T. goetzenii*), *Purseglove* 2175, etc.

Eritrea : *Pappi* 720 FI, 864 FI, 2821 FI (types of *T. calocephalum* var. *parviflorum*).

Abyssinia : (North) *Rueppell* s.n. FR (type), *Dillon and Petit* s.n. P type of *T. umbellulatum*, *Schimper* 1853 806, (1863–8) 607, 1279, (Central) *Wellby* s.n., *Dobinson* s.n. BM.

Uganda–Kenya : (Elgon) *Thomas* 588, 2713, *Hedberg* 1012 UPS.

Kenya : Central highlands *Napier* 1242, *Edwards* 2972, *Shantz* 1175, *Bogdan* 3197.

Tanganyika : (Mbulu Distr.) *Greenway* 7734, *McKinnon* 1, *Peter* 43977. 2100–3600 m.

Wellby s.n. is the only specimen which shows rooting at the nodes. The type specimen of *T. goetzenii* has been destroyed. Its large corolla 9 mm. and 5 ovules show that it cannot be united with *T. rueppellianum* as was done by Taubert and by Harms. *T. tembense* definitely occurs in the area where the type specimen was collected and the description agrees well.

(26) **T. calocephalum** *Fres.* in Flora **22** (1839) 50 ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 14. *Loxospermum calocephalum* (Fres.) Hochst. in Flora **29** (1846) 595.

Abyssinia : (North) *Rueppell* s.n. FR (type), *Schimper* (1853) 328 ; (Central) *Roth* 236, *Omer Cooper* s.n.
c. 2700 m.

This species is most closely related to *T. tembense*, as is shown especially by the shape of the standard. Hochstetter placed it in *Loxospermum*, being influenced by the many-seeded pod. However, if the many-nerved calyx is dropped in order to include *T. calocephalum*, *T. tembense* must also be included in *Loxospermum* and any distinction between that subsection and *Euamoria* becomes impossible. This species is said to be very beautiful (Chiovenda 1912) and should be worth cultivating as a garden plant.

Subsection 2C. LOXOSPERMUM (*Hochst.*) *Celak* in Oest. Bot. Zeit. **24** (1874) 41. As a genus Hochst. in Flora **29** (1846) 594.
Confined to NE. and E. tropical Africa.

Key to subsection *Loxospermum*.

A. Standard under 15 mm. long ; calyx teeth under 10 mm. long :

B. Flowers in a pedunculate inflorescence :

Inflorescence of 6–12 flowers ; calyx c. 4 mm. long, less than half as long as corolla, the teeth ± 2 mm. long ; leaflets broadly elliptical ; ovules 3–5 . . . . . 27. *T. decorum*

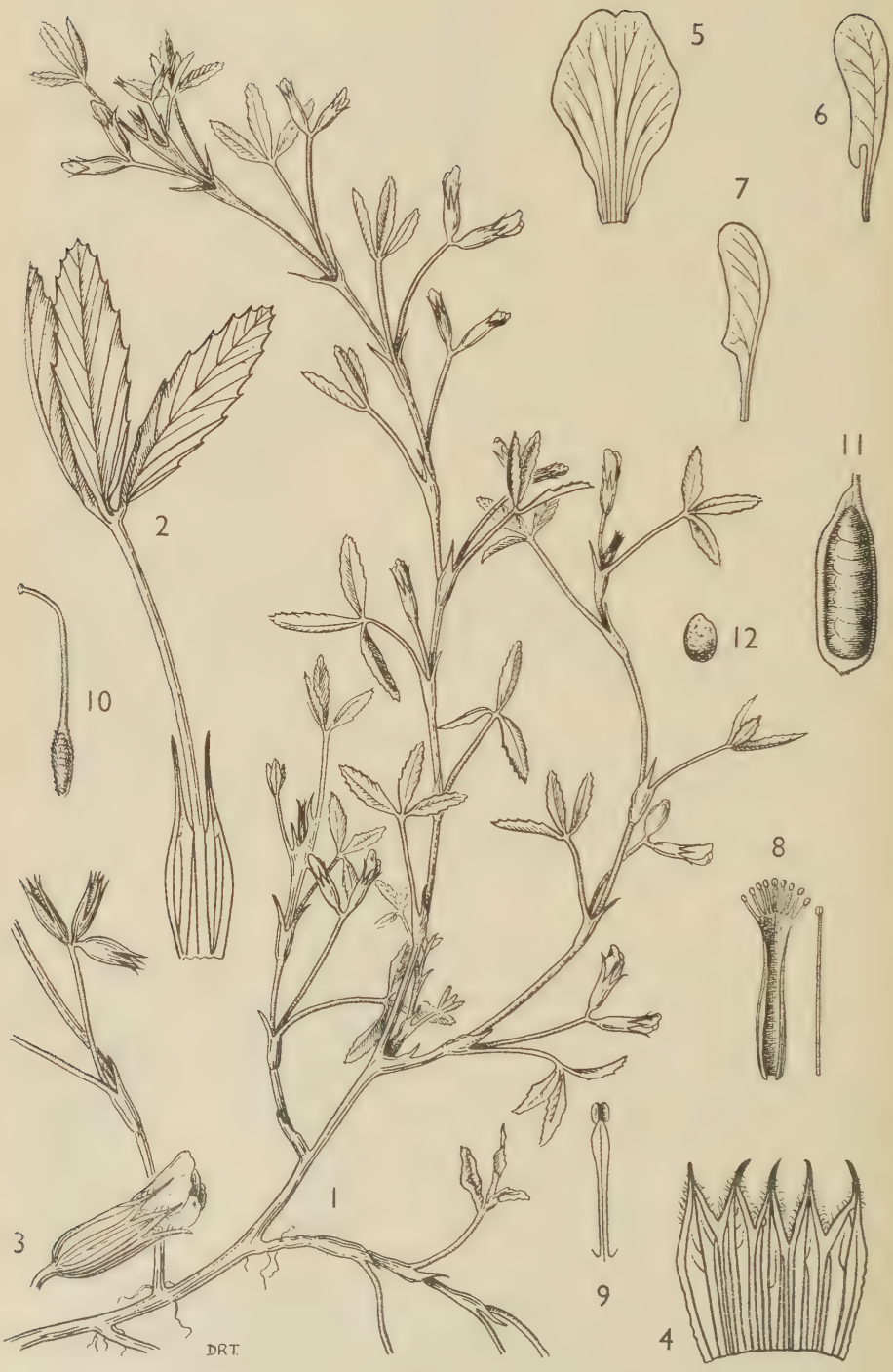

FIG. 5. *Trifolium multinerve* (after Snowden 1018). 1, flowering branch, × 1 ; 2, leaf × 3 ; 3, flower, × 3 ; 4. calyx, flattened out, × 4 ; 5, standard petal, × 4 ; 6, wing petal, × 4 ; 7, keel petal, × 4 ; 8, stamens, × 4 ; 9, anther and free part of filament × 16 ; 10, pistil, × 4 ; 11, fruit, × 3 ; 12, seed, × 4.

Inflorescence of 1–5 flowers ; calyx 6–10 mm. long, more than half as long as corolla, the teeth 3–7 mm. long ; leaflets oblanceolate ; ovules 6–9 . . . . . 28. *T. multinerve*

B′. Flowers subsessile, single or 2-nate in the leaf axils ; leaflets obovate ; ovules ± 6 . . . . . 29. *T. elgonense*

A′. Standard over 15 mm. long ; calyx teeth 10 mm. or more long ; leaflets linear-lanceolate ; flowers 1–5; ovules ± 8–15 30. *T. schimperi*

27 **T. decorum** *Chiov.* in Ann. Bot. Rom. **9** (1911) 56 ; Fiori in N. Giorn. Bot. It. n.s. **55** (1949) 341 & fig. 16.

Abyssinia : (North–Gondar) *Chiovenda* 1110 FI, 1197 FI, 1199 FI, 1391 FI (syntypes) ; (Tigré) *Schimper* (1863–8) 1281 ; *Plowden* s.n.

28 **T. multinerve** *Hochst. A. Rich.* Tent. Fl. Abyss. **1** (1847) 175 ; Fiori in N. Giorn. Bot. It. n.s. **55** fig. 15. *Trigonella multinervis* Hochst. & Steud. in sched. Pl. Schimp. Ab. 1 300 (*nomen*). *Loxospermum multinerve* Hochst. in Flora **29** (1846) 595, including *T. multinerve* var. *debilior* A. Rich. Tent. Fl. Abyss. **1** (1847) 175.—Fig. 5.

Belgian Congo–Uganda : (Virunga Mts.) *Humbert* 8646 BR, *Eggeling* 1101, etc.

Eritrea : *Pappi* 2259, *Baldrati* 2047 FI, 4208 FI.

Abyssinia : (North) *Schimper* (1837, 300 isotype), *Petit* s.n. P. (type of var. *debilior*), *Schimper* (1853) 464, (1863–8) 1270 ; (Central) *Omer Cooper* s.n.

Sudan : (Imatongs) *Thomas* 1837.

Uganda–Kenya : (Elgon) *Snowden* 1018, *Thomas* 332, 498, 2534, *Lugard* 397, *Mrs. Tweedie* 851.

Kenya : (Eldoret) *Harvey* 1379 ; (Mt. Kenya) *Lyne Watt* 1147.

1800–3600 m.

This species is polymorphic. *Thomas* 498 and 1837 in some respects approach *T. elgonense* and may indicate that hybridisation takes place between the two species.

(29) **T. elgonense** *Gillett* sp. nov.—Fig. 4/9

A *T. multinerve* (Hochst.) A. Rich. floribus subsessilibus, foliolis latioribus, brevioribus, calycis dentibus brevioribus differt.

Herba parva, ut videtur annua. *Caules* procumbentes, ad nodos non radicantes, ad 10 cm. longi, glabri. *Folia* glabra usque ad 1·5 cm. petiolata. *Foliola* cuneato-obovata, ad 6 mm. longa, 5 mm. lata, c. 0·5 mm. peliolulata, apice truncata vel plus minusve emarginata, grose serrata, nervis utrinque 4–6. *Stipulae* latae membranaceae 2–4 nervatae, ad petiolum per c. 2 mm. adnatae, parte libera late acuminata c. 2 mm. longa. *Flores* in axillis foliorum solitarii vel varius 2– , sessiles vel ad 1·5 mm. pedicellati. *Calyx* inflatus c. 25 nervosus, tubo 3·5 mm. longo glabro, dentibus triangularibus, 1·5 mm. latis, 2–2·5 mm. longis, apice breviter subulatis, margine villosis, post anthesin paulo accrescens.

Corolla purpurascens. *Vexillum* oblongo-obovatum, basi sensim attenuatum, 9 mm. longum, 4 mm. latum. *Alae* in toto 8 mm. longae, lamina oblonga 4·5 mm. longa. *Carinae* lamina 3 mm., unguis 4·5 mm. longa. *Stamina* 6–7 mm. longa. *Ovarium* 6–7-ovulatum brevissime hispidum. *Stylus* 4 mm. longus. *Legumen* 6-spermum, 6 mm. longum, 2·5 mm. latum, papyraceum, translucens, margine incrassatum.

Uganda–Kenya : Mount Elgon. Eastern slopes above Japata estate, alpine belt, close to small stream, 3450 m., 3 Mar. 1948, *O. Hedberg* 266 (type) UPS ; Madangi, locally common on moist rocks in grassland, 3420 m., 15 Dec. 1938, *A. S. Thomas* 2714 ; in grass, 3400 m., 22 Febr. 1935, *G. Taylor* 3578 BM :—flowers magenta.

This plant bears a superficial resemblance to *T. acaule*.

(30) **T. schimperi** (*Hochst.*) *A. Rich.* Tent. Fl. Abyss. **1** (1847) 173 : Fiori in N. Giorn. Bot. It. n.s. **55** (1949) fig. 13. *Trigonella schimperi* Hochst. & Steud. in Sched. Pl. Schimp. Ab. **1**, 86, *nomen*. *Loxospermum schimperi* Hochst. in Flora **29** (1846) 594.

Abyssinia : (North) *Schimper* (1837) 86 (type), (1844) 1988, (1863–8) 275 ; (Central) *Omer Cooper* s.n., *Hugh Scott* 9.

Section 3. MISTYLUS (*Presl*) *Celak.* in Oest. Bot. Zeit. **24** (1874) 41. As genus, Presl Symb. Bot. **1** (1830) 49.

Key to section *Mistylus*.

Corolla shorter than calyx, c. 2 mm. long ; calyx teeth 6–7 mm. ; flowers usually more than 20 in each head . . 31. *T. lugardii*

Corolla exceeding the calyx :

Corolla c. 7 mm. long ; calyx teeth 2–4 mm. long . . 32. *T. steudneri*

Corolla c. 11 mm. long ; calyx teeth 6–7 mm. long ; flowers usually fewer than 20 in each head . . . . . 33. *T. quartinianum*

(31) **T. lugardii** *Bullock* in Kew Bull. 1932, 494.

Uganda–Kenya : (Mt. Elgon) *Lugard* 97 (type), *Tweedie* 81 EAH, 172 EAH, 597, 684, *Thomas* 445.

1800–2200 m.

(32) **T. steudneri** *Schwf.* in Verh. Zool. Bot. Gesell. Wien **18** (1868) 652, Edwards & Bogdan, Important Grassland Plants of Kenya (1951) 96, fig. 33 : 3. *T. schimperianum* Hochst. in sched. Pl. Schimp. Ab. 3 1884 (*nomen*). *T. bellianum* Chiov. in Ann. Ist. Bot. Rom. **8** (1908) 407.

Eritrea : *Pappi* 104 FI, 2315 FI (syntypes of *T. bellianum*).

Abyssinia : (North) *Plowden* s.n., (*Steudner* 159 B type), *Schimper* (1842) 1884 BM, (1863) 418 BM.

Kenya : (Mt. Elgon) *Lugard* 38, *Tweedie* 199, 683, *Hedberg* 37 UPS, (Central highlands) *Toogood* 2970, *Edwards* 3145, *Bogdan* 3222.

1800–3000 m.

Palatable and probably valuable according to Edwards and Bogdan (1951).

The type has presumably been destroyed. However, *Schimper* (1863–) 418, of which a duplicate is in the British Museum, is cited as *T. steudneri* by Engler (1892) 254 and as Engler had access to Steudner's type this may be taken as authentic.

(33 **T. quartinianum** A. Rich. in Tent. Fl. Abyss. **1** (1847) 169.
ERITREA : *Pappi* 1369.
ABYSSINIA : (North) near. Tchalatchekanne *Dillon* s.n. P (type), *Schimper* (1853) 642, (1863–8) 300 BM, 1371.
UGANDA : (East) *Snowden* 409.
1500–2600 m.

Section 4. GALEARIA (*Presl*) *Celak* in Oest. Bot. Zeitschr. **24** (1874) 44. As genus, Presl. Symb. Bot. **1** (1830) 49.

KEY TO SECTION *GALEARIA*.

A. Annuals :
B. Upper lip of fruiting calyx pilose, attenuated towards the apex 34. *T. resupinatum*
B′. Fruiting calyx woolly, globose, upper lip not attenuated toward the apex . . . . . 35. *T. tomentosum*
A′. Perennial; fruiting calyx pilose . . . . . 36. *T. fragiferum*

34 **T. resupinatum** *L.* Sp. Pl. (1753) 771 ; Chiov. in Ann. Ist. Bot. Rom. **8** (1908) 407.
ERITREA : (*Pappi* 4874).

Although Chiovenda seems to consider the species indigenous in Abyssinia, Fiori (1949) 346 states that it was introduced. I have seen no specimens from tropical Africa.

(35) **T. tomentosum** *L.* Sp. Pl. (1753) 771.
SUDAN : (Red Sea Hills, Erkowit) *Aylmer* 195, *Andrews* 3479.
1200–1500 m.

(36) **T. fragiferum** *L.* Sp. Pl. (1753) 772.
SOUTHERN ARABIA : Dahar Plateau, c. 110 km. NE. of Aden, 2000 m. *Maxwell Darling* 225.
ABYSSINIA : (North) *Schimper* (1863–8) 718, 720.

Not previously recorded from tropical Arabia.

Section 5. EULAGOPUS *Lojac.* in N. Giorn. Bot. It. **15** (1883) 232.

KEY TO SECTION *EULAGOPUS*.

Calyx teeth more than twice as long as tube, inflorescence pedunculate 36. *T. arvense*
Calyx teeth less than twice as long as tube, inflorescence usually sessile 37. *T. stipulaceum*

(see also No. 20 *T. bilineatum* and 21 *T. pichisermollii*).

(37) **T. arvense** *L.* Sp. Pl. (1753) 769.

Sudan : (Red Sea Hills) *Aylmer* 194, *Andrews* 3494.

Eritrea : *Schweinfurth and Riva* 1534, *Pappi* 4698, *Baldrati* 398 FI, 4348 FI, etc.

Abyssinia : (North) *Schimper* (1863) 352 BM, (1842) 1518 BM, (1837) 322 BM.

1200–2400 m.

(38) **T. stipulaceum** *Thunb.* Prodr. Fl. Cap. (1800) 136; Harvey Fl. Cap. **2** (1862) 160. *T. micropetalum* E. Mey. Comm. Pl. Afr. Austr. (1836) 90.

Cape Province : (Coast, Saldanha bay to Port Elizabeth) *Thunberg* s.n. UPS type), *Drege* s.n. (isotype of *T. micropetalum*), *Ecklon and Zeyher* 1512, *Burchell* 6171, *Salter* 7720, *Wolley Dod* 3279.

The occurrence of this species in the Cape, so far removed from all others of the section *Eulagopus* is a remarkable instance of discontinuous distribution, which is, however, parallelled by several others in the Cape Flora.

Besides the species listed above a large number of European species occur as introduced plants in South Africa. Eleven are listed in the Flora of the Cape Peninsula by Salter and Adamson (1950). Other European species have been experimentally introduced at various agricultural stations in tropical Africa, without much success. *T. alexandrinum* L. is occasionally cultivated in the Sudan, but does not succeed there as it does in Egypt.

Geographical Distribution

The distribution of the species within Africa is summarised in the table. References in literature which appear to contradict or amplify these records should be used with caution as they often depend on a vague use of geographic terms which does not correspond with the present day use of these terms. Thus for instance, P. E. Glover (1947) 217 records 4 species of *Trifolium* from British and Italian Somaliland but, as far as can be ascertained, no *Trifolium* has ever been collected in either of those territories. The first feature revealed by the table is the great concentration of species in northern Abyssinia and Eritrea. This is of course in accordance with a probable immigration of the genus, from the Mediterranean region through this area. All the species which are also found north of the tropics are in tropical Africa confined to this area. It does not appear that any *Trifolium* species have reached tropical Africa by way of the Tibesti mountains in the central Sahara ; all the 4 species in the Cameroons are also found in East Africa and no species has yet been recorded from the Jebel Marra in the western Sudan which reaches 3000 m. and appears to possess the right habitat conditions. In view of the wealth of *Trifolium* species in Abyssinia and the very limited botanical exploration of the south of that country, additional species may well remain to be discovered there.

The concentration of *Trifolium* species in certain areas such as the Virunga Mts., Elgon and Ngorongoro has already been referred to under

T. purseglovei and the suggestion offered that this may be connected with a higher than usual phosphate content in the soil. The absence of *Trifolium* species from several regions where they might be expected to occur is also remarkable. For instance although the genus must presumably have once spread through Rhodesia in order to reach South Africa no specimens have been recorded from any of the apparently suitable mountain areas between the southern Transvaal and northern Nyasaland.

The distribution of subsection *Ochreata* is interesting. There are no signs here of a concentration in Abyssinia. On the contrary the area north of Lake Nyasa is the richest in species. It would appear probable that this very natural endemic subsection originated in equatorial Africa. It is significant that *T. usambarense* in this subsection shows the greatest adaptation to tropical conditions occurring at only 850 m. near the equator.

The world distribution of *Trifolium* provides some puzzles. Presumably the genus originated in the Mediterranean region. There is the greatest wealth and variety of species and here are also concentrated nearly all the other genera in the *Trifolieae*. On this assumption it is extremely strange that the genus, while being able to spread across the tropics to reach the Cape has not been able to spread along an uninterrupted belt of apparently suitable country to reach Assam and Yunnan. A possible explanation may be that cooler areas opened up in the tropics by the elevation of land or a change in climate may be less thoroughly colonised by the surrounding tropical vegetation than would a similar area in a temperate region. Thus a temperate plant reaching such an area from the north would have a better chance of establishing itself than if it had moved east or west in its own climatic belt. This ability to cross the equator is also shown by *Trifolium* in America.

Economics.

Collectors' notes show that several of the Tropical African species of *Trifolium* are valuable fodder plants locally and it would appear that they may provide a source of plant material for the enrichment of artificial and natural pastures in the highlands of the tropics and in subtropical areas. In Abyssinia, Baker (1871) quoting Dr. Roth records that *T. rueppellianum* is sometimes cultivated as a forage plant. This is repeated by Fiori (1939) without any details, but Chiovenda (1912) while reaffirming the value of *T. rueppellianum* states that he never saw this, or any other *Trifolium* species cultivated in Abyssinia. Chiovenda suggests that, of the 14 species of *Trifolium* which he collected in northern Abyssinia, *T. polystachyum*, *T. rueppellianum*, *T. tembense* and *T. decorum* are most likely to prove of value at altitudes between 1800 and 2400 m. while *T. calocephalum*, *T. petitianum* and *T. semipilosum* might be useful at higher altitudes. It has not been possible to trace any records of Italian work following up these suggestions.

In British East Africa several authors mention valuable pastures of Kikuyu grass (*Pennisetum clandestinum* Hochst.) associated with various *Trifolium* spp. in areas where the natural vegetation is montane evergreen forest and usually in places where such forest has only recently been destroyed. In Uganda A. S. Thomas (1940) states that such pastures are

best developed in Kigezi and on Mt. Elgon at from 1800–1950 m. He states that several clovers are concerned without mentioning the species, but *T. pseudostriatum*, *T. purseglovei*, *T. usambarense* and *T. baccarinii* are perhaps those in question. In Kenya, areas above 1800 m. with an annual rainfall of over 1000 mm. are of great economic importance and are described by D. C. Edwards in several reports and papers. The *Trifolium* species concerned is referred to as *T. johnstonii* but it would appear that it is usually (if not always) *T. semipilosum* var. *glabrescens* which is meant, while *T. semipilosum* var. *semipilosum*, *T. burchellianum* var. *johnstonii* and *T. cheranganiense* may be of lesser importance in particular spots. These pastures only occur where soil fertility is high, either as result of a former forest cover or because of good grazing management, with or without the addition of phosphatic manures. Where fertility is allowed to run down, both the clover and the Kikuyu grass disappear. In the Kenya highlands clover is so widespread that it has usually not been found necessary to sow it, but it would seem likely that eventually, as has happened in Britain with *T. repens*, selected strains will be used. On Kilimanjaro, Haarer (1951) states that the valuable clovers associated with Kikuyu grass are *T. semipilosum*, *T. rueppellianum* (perhaps *T. baccarinii*?) and *T. usambarense*. In the Mbulu District—Masai steppe area numerous clovers occur and several collectors refer to the value of *T. masaiënse* here. However, it has not been possible to trace any ecological or economic account of the pastures which include this species.

Van Rensburg (1950) reports that six species of *Trifolium* from the Mbulu district were cultivated experimentally at Mpwapwa, in all cases without economic success. The altitude at Mpwapwa is however 1000 m. and the rainfall c. 730 mm. and it seems clear that such conditions are not suitable for *Trifolium*, at any rate without irrigation.

At high altitudes (2700–2850 m.) on Mt. Elgon, Thomas (1940) reports that a valuable close sward is formed under heavy grazing, consisting of *Digitaria scalarum* and *T. cryptopodium* and it is probable that this species might find wider application at such altitudes.

I am indebted to Mr. J. McCulloch of the Nigerian Veterinary Service for the information (*in litt.*) that certain clovers (as yet not fully collected) are very common and valuable constituents of pastures at c. 2000 m. in the British Cameroons. Kikuyu grass is not indigenous here but when introduced has proved "fantastically successful" often in association with the self-sown clovers.

At altitudes of less than 1700 m. in tropical Africa *Trifolium* only seems to occur in areas free from prolonged drought and with an annual rainfall approaching 1600 mm. or more. It is not clear what the lower altitudinal limit of the genus may be under such conditions since these areas are normally forested and the species must have spread downwards since they were opened up by human activity. The species which occur are *T. usambarense* (down to 850 m. in the Usambaras) *T. baccarinii* (down to 1200 m. in the Cameroons) and *T. pseudostriatum* (down to 1350 m.) Each of these has been reported as a valuable component of heavily grazed pastures. With increasing densities of human population the establishment of carefully managed and fertilised temporary or permanent artificial pastures in areas below 1700 m., which would, under natural conditions, be occupied by tropical forest, is becoming more and

more important, and it may well be that in some of these areas one or more of the species mentioned above may prove of great value.

Goldschmidt and Orchard (1940) report that experiments have been carried out on the establishment of *T. africanum* in pastures of the mist belt region of Natal. It is not clear what success was achieved. Only one reference has been found to the use of tropical African species in South Africa; an attempt to establish "*T. johnstonii*" in Basutoland in an area which proved too dry and too cold for its successful growth.

To sum up: no hope can be held out that these clovers are likely to be of use in areas which suffer from a low total rainfall or prolonged seasonal drought. In attempting to establish them in other areas two facts must be remembered (1) they will probably need phosphates (2) their natural associate is often Kikuyu grass. Since this species has been experimented with, successfully or unsuccessfully, in many parts of the world reference to these experiments will provide some indication as to whether one or other of these *Trifolium* species is likely to be successful.

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	Cameroons	Southern Arabia	Sudan (Red Sea Hills)	Eritrea	North Abyssinia	Central Abyssinia	South Abyssinia	Sudan (Imatongs)	SW. Uganda & E. Bel. Congo	Elgon & Cherangani	Central highlands of Kenya	Mt. Kenya	Mbulu Distr. & Masai steppe	Kilimanjaro	Iringa Distr.	Mts. N. of Lake Nyasa	Angola	Transvaal	Eastern Cape	Western Cape
1. campestre			×	×	×															
2. cryptopodium					×					×	×	×		×						
3. usambarense	×						×		×	×	×	×	×	×		×				
4. polystachyum				×	×	×		×		×							×			
5. mauginianum						?														
6. somalense							×													
7. stolzii						×										×				
8. wentzelianum																×				
9. cheranganiense										×										
10. ukingense																				
11. simense	×			×	×	×		×	×	×	×		×		×	×				
12. africanum																		×		
13. burchellianum							×			×	×	×	×	×			×		×	×
14. purseglovei									×											
15. acaule					×	×				×										
16. petitianum				×	×															
17. semipilosum		×		×	×	×	×				×	×	×	×						
18. masaiënse													×							
19. pseudostriatum									×							×				
20. bilineatum				×	×															
21. pichisermollii						×														
22. rueppellianum	×			×	×	×		×	×	×	×		×	×	×	×				
23. mattirolianum					×															
24. baccarinii	×				×				×	×				×		×				
25. tembense				×	×	×			×	×	×		×							
26. calocephalum					×	×														
27. decorum					×															
28. multinerve				×	×	×		×	×	×		×								
29. elgonense										×										
30. schimperi					×	×														
31. lugardii										×										
32. steudneri				×	×					×	×									
33. quartinianum				×	×					×										
34. resupinatum				×																
35. tomentosum			×																	
36. fragiferum		×			×															
37. arvense			×	×	×															
38. stipulaceum																				×
Totals in each area	4	2	3	13	20	11	4	4	8	15	8	5	7	6	2	8	2	1	2	2

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Numbers show the position, in the sequence here adopted, of the taxon under which the name is treated. Numbers in brackets are subsidiary references ; a G. or an E. indicate that the name is mentioned in the discussion of Geographic distribution or Economics.

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NOTES ON AFRICAN ASCLEPIADACEAE. I.

A. A. Bullock.

The following notes are based on preliminary work connected with the new East African flora now in active course of preparation at Kew and on the work involved in naming the writer's own collections in central Africa.

In many cases the specimens available for study are either too scanty or in an unsuitable condition for revisional work ; collectors should endeavour to obtain complete material of each species ; root and root-stock characters, often providing valuable specific and even generic characters, are still unusable on account of the incompleteness of herbarium material and observational data ; fruit characters—practically unmentioned except occasionally in specific descriptions—are even more valuable for specific and generic diagnosis. The possibility of the existence of hybrid swarms should not be overlooked and I have drawn attention to some putative cases in the text.

Hitherto, generic and specific differentiation has been based entirely on floral, particularly coronal, characters. Without casting any doubt on the value of such characters, the writer has concluded that they have been overstressed and due allowance has not been given to changes in relation to flower age, whilst habital characters have been ignored. There seems to be no doubt that coronal development proceeds for some time after anthesis and that the various coronal appendages grow at different rates; similarly, as may be expected in such fleshy structures, the flower as a whole does not at once wither as a post-pollination effect, but there is gradual deterioration which appears in herbarium specimens as changes in shape and size. Wherever possible, collectors should preserve flowers of all ages in spirit.

It may appear that some of the extensive new synonymy listed below is too drastic ; it is, however, dictated by the necessity of being able to provide names for new specimens on the one hand and of constructing workable " keys to species " on the other. The resuscitation of genera discarded by the late Dr. N. E. Brown and others will, it is hoped, result in the more accurate identification of groups of species clearly allied to each other ; this part of the work is to be regarded as tentative, though there seems no reason why, from a practical point of view, the existence of species apparently intermediate in generic characters between two otherwise clearly separable groups should necessitate the linking of those groups under one generic name. The use of a wider range of characters frequently results in a clearer and more accurate understanding of generic limits.

The resuscitated genera are not here defined, except by reference to some of their species, but they are based either on types clearly indicated by the original authors or on lectotypes chosen by the writer or others. Some of the name changes proposed are the result of these resuscitations ; others are dictated by the application of the Rules of Nomenclature now in force, whereas many names hitherto in use were based on the old "Kew Rule " which permitted the retention of the earliest specific epithet available under the generic name regarded as correct.

Robert Brown's segregation of *Gomphocarpus* from *Asclepias* was published in his account of the *Asclepiadaceae* (Mem. Wern. Soc. **1,** 19–58) in 1809 and this was accepted by most botanists for nearly a century, whilst more and more species were being described under both names. By the time N. E. Brown considered the species for the *Flora of Tropical Africa* (1902–4) both had become large and unwieldy and he decided to discard *Gomphocarpus* and transfer most of its species to *Asclepias*. For some years the name *Gomphocarpus* persisted in the literature but before 1909 when Brown completed his account of the family in the *Flora Capensis*, the name had fallen into desuetude and there are only occasional references to it since that date.

I believe, however, that Robert Brown was completely justified in confining *Asclepias* Linn. to the New World, and in creating a separate genus—*Gomphocarpus*—for some of the African species. I propose to exclude *Asclepias* Linn. from Africa, except as an adventive, and to divide further the species hitherto assigned to it into other genera proposed by Robert Brown, E. Meyer and, later, R. Schlechter.

In these circumstances, it is necessary to recall that *Asclepias syriaca* Linn. is listed as the standard (type) species of the name *Asclepias* Linn. ; I have selected *Gomphocarpus fruticosus* (Linn.) Ait. f.* as lectotype of the name *Gomphocarpus* R. Br.

Asclepias curassavica Linn., now widespread in Africa and throughout the tropics of the Old World, is an American plant and a very fair representative of the genus in the restricted sense here adopted.

Gomphocarpus fruticosus (*Linn.*) *Ait. f.* Hort. Kew. ed. 2, **2,** 80 (1811), lectotypus nominis generici ; Decne. in DC. Prodr. **8,** 557 (1844) ; Durand, Syll. Fl. Congol. 359 (1909).

Asclepias fruticosa Linn. Sp. Pl. 216 (1753) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 330 (1902) et in Thiselton Dyer, Fl. Cap. **4** (1), 691 (1908) ; auctt. num. ab N. E. Br. *ll. cc.* enum., non Schltr. in Warb. Kunene–Samb.–Exped. Baum, 342 (1903).

A. glabra Mill. Gard. Dict. ed 8, No. 12 (1768).

A. setosa Forssk. Fl. Aegypt. Arab. [p. cvii. No. 181, nomen], 51 (1775) ; Vahl, Symb. Bot. **1,** 23, t. 8 (1790).

Gomphocarpus tomentosus Burch. Trav. **1,** 453 (1822) ; Durand, Syll. Fl. Congol. 360 (1909).

G. frutescens E. Mey. Comm. Pl. Afr. Austr. 202 (1837), errore orthogr.

G. lanatus E. Mey. *l.c.*

G. abyssinicus Hochst. in Flora, **27,** 101 (1844).

G. cornutus Decne. in Ann. Sc. Nat. Sér. 2, **9,** 324 (1838), et in DC. Prodr. **8,** 557 (1844).

G. setosus (Forssk.) Decne. in Ann. Sc. Nat. Sér. 2, **9,** 324 (1838).

Asclepias crassifolia Decne. in DC. Prodr. **8,** 572 (1844).

Gomphocarpus verticillatus Turcz. in Bull. Soc. Nat. Mosc. **21,** 258 (1848).

G. purpurascens A. Rich. Tent. Fl. Abyss. **2,** 38, t. 69 (1851).

*R. Brown, to whom this combination is usually attributed, did not in fact publish it, though he did refer *Asclepias fruticosa* Linn. to his new genus *Gomphocarpus*.—A. A. B.

G. crinitus Bertol. in Mem. Accad. Sc. Istit. Bologna, **3,** 253, t. 20, f.1 (1851).

G. fruticosus var. *purpureus* Schweinf. Beitr. Fl. Aethiop. 129 (1867).

G. fruticosus var.—Vatke in Oesterr. Bot. Zeitschr. **26,** 146 (1876).

G. fruticosus var. *angustissimus* Engl. Hochgebirgsfl. Trop. Afr. 341 (1892).

Asclepias fruticosa var. *angustissima* (Engl.) Schltr. in Journ. Bot. **33,** 335 (1895).

A. burchellii Schltr. in Journ. Bot. **33,** 336 (1895), in adnot., et in Engl. Bot. Jahrb. **21,** Beibl. No. 54, 5 (1896) ; N. E. Br. in Thiselton Dyer, Fl. Trop, Afr. **4** (1), 335 (1902), et in Thiselton Dyer, Fl. Cap. **4** (1), 690 (1908).

A. phillipsiae N. E. Br. in Kew Bull. **1895**, 219 (1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 332 (1902) ; Schltr. in Notizbl. Bot. Gart. Berlin **9,** 26 (1924) ; Robyns, Fl. Sperm. Parc Nat. Albert, **2,** 92, t. 10 (1947) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Pt. 2, 63 (1949).

A. flavida N. E. Br. in Kew Bull. **1895**, 255 (1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 331 (1902) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Pt. 2, 63 (1949).

Gomphocarpus fruticosus var. *tomentosus* K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 322 (1895).

Asclepias pubiseta N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 329 (1902) ; Schltr. in Notizbl. Bot. Gart. Berlin, **9,** 26 (1924).

A. abyssinica (Hochst.) N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 333 (1902).

A. albida N. E. Br. *l.c.* 334.

A. crinita (Bertol.) N. E. Br. *l.c.* 352, sub. spp. imperf. conn., et in Thiselton Dyer, Fl. Cap. **4** (1), 693 (1908).

A. decipiens N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 689 (1908).

A. euphorbioides A. Chev. in Journ. de Bot. Sér. 2, **2,** 117 (1909).

A. lanata (E. Mey.) Druce in Rep. Bot. Exch. Club Brit. Isles, **1916,** 605 (1917).

A. semilunata N. E. Br. apud Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 56 (1931), quoad syn. tantum, non N. E. Br. (1902).

The wide ecological tolerance of this species is expressed in its variability ; in the *Flora of Tropical Africa* N. E. Brown recognised eight species here united and no fewer than five other authors recognised varieties. Some of the forms described appear at first sight to be geographically isolated but closer examination shows that they pass gradually—both geographically and morphologically—into other forms. In limited areas, only one form may be found ; this applies particularly to *Asclepias phillipsiae*, the only form recorded by Robyns in his flora of the Albert National Park.

The great number of specimens at Kew presents a number of problems from the point of view of their taxonomic status, and I believe that hybrid swarm populations exist in which *G. fruticosus* is a prominent original parent. Other species involved are mentioned in appropriate places below.

Geographically *G. fruticosus* extends from South and South-west Africa northwards through the savannah and semi-arid areas of Central and East Africa to North Africa and the eastern Mediterranean region ; it is recorded also from Madeira and the Canaries and it has been introduced into many parts of the tropics of the Old World, including Australia. It does not appear to have gained a foothold in the New World.

Gomphocarpus physocarpus *E. Mey.* Comm. Pl. Afr. Austr. 202 (1837), et auctt. num. a N. E. Br. (1902, 1908) enum.

G. semilunatus A. Rich. Tent. Fl. Abyss. **2,** 39 (1851).

Asclepias denticulata Schltr. in Journ. Bot. **33,** 334 (1895) ; Hiern in Cat. Afr. Pl. Welw. **1,** 685 (1898).

A. physocarpa (E. Mey.) Schltr. in Journ. Bot. **34,** 453 (1896) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 328 (1902), et in Thiselton Dyer, Fl. Cap. **4** (1), 692 (1908), incl. syn. ; Schltr. in Notizbl. Bot. Gart. Berlin, **9,** 26 (1924).

A. semilunata (A. Rich.) N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 328 (1902) ; Schltr. in Notizbl. Bot. Gart. Berlin, **9,** 27 (1924) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 56 (1931), excl. syn. ; Robyns, Fl. Sperm. Parc Nat. Albert, **2,** 90 (1947) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Pt. 2, 64 (1949).

A. kassneri N. E. Br. in Journ. Bot. **41,** 362 (1903), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 616 (1904).

In tropical and southern Africa the range, ecologically and geographically, of this species, is but slightly less than in the case of *G. fruticosus*. Elsewhere it has been recorded from numerous widely separated localities in the tropics and subtropics of the Old World, where it is almost certainly introduced as a weed of cultivation.

The Kew Herbarium includes a number of specimens intermediate between this and *G. fruticosa* and I suggest that these represent hybrids. One of them, *Asclepias frederici* Hiern, has received a specific name, for which I propose the following name :—

Gomphocarpus x **frederici** (*Hiern*) *Bullock*, hybr. putat. nov.

Asclepias frederici Hiern in Cat. Afr. Pl. Welw. **1,** 684 (1898) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 335 (1902).

This was described from *Welwitsch* specimens collected in Angola, but I have seen similar—though not exactly matching—plants from Kenya, Tanganyika and the Sudan.

Gomphocarpus integer (*N. E. Br.*) *Bullock*, comb. nov.

Asclepias integra N. E. Br. in Kew Bull. **1895,** 219 (1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 334 (1902), partim, quoad descr. et spec. sicc. cit. somaliensia, excl. syn. et spec. ceteris.

The original description of this species was based on three specimens from Somaliland collected respectively by *Mrs. Lort Phillips*, *Miss Edith Cole* and *James and Thrupp*, and on three specimens collected on Kilimanjaro by *Smith*, *Volkens* and *Johnston*. These specimens are not con-

specific and it becomes necessary to choose a lectotype in order to fix the application of the specific name.

Brown's description to a large extent covers all the specimens, as he intended, but his description of the fruit and seed clearly applies to the specimen collected by *Mrs. Lort Phillips*, which shows mature follicles. So far as it goes, the description excludes the Kilimanjaro specimen collected by *Johnston*, which shows a young follicle clothed with filiform processes, not smooth as implied in the description. The type (lectotype) of the specific name must be, therefore, the Somaliland specimen of *Mrs. Lort Phillips* ; the other Somaliland specimens cited by Brown I believe to be conspecific but they must be regarded as elements additional to the type.

Among the Kilimanjaro plants, two distinct elements can be distinguished. As stated above, the *Johnston* specimen shows a young follicle clothed with filiform processes much like those of *Gomphocarpus fruticosus* whilst the *Volkens* No. 567 specimen shows a smooth beaked follicle strongly recalling that of *G. rostratus* (N. E. Br.), Bullock a plant of similar habit but known only from Angola and Ngamiland. It is a much broader follicle than that of *G. integer* and in texture it is intermediate between that species and *G. stenophyllus* Oliv.

The separation of these two elements of Brown's species by means of the fruit characters is supported by a slight difference in coronal structure at least in the case of the *Johnston* specimen (the flowers of the *Volkens* specimen have not attained anthesis and I would regard the coronal structure as somewhat unreliable). There are, also, other specimens which may be associated with all the three elements on the basis of the fruit characters, and it is found that the small floral and vegetative differences observable in the specimens cited by Brown (and evidently regarded by him as individual variations) are correlated with them. The specimens concerned are briefly listed below :—

1. *A. integra* N. E. Br. *sensu stricto*. (Narrow, smooth follicles).
   British Somaliland : Mrs. Lort Phillips (Received June 1895—type) ; *Miss Edith Cole* (11 Feb. 1895) ; *James and Thrupp* (Communicated 1885) ; *Mrs. Lort Phillips* (1897) ; *Appleton* (Communicated July, 1903) ; *Thomson* 70 (Received Jan. 1904) ; *Drake-Brockman* (Communicated Oct. 1905).
2. *Specimens associated with Volkens* 567. (Smooth broad follicles).
   Kenya Colony : Longinot, *Greenway* 5998 ; Kedong Valley, *Chater Jack* 21 ; Kedong Escarpment, *Dale* 3071 ; Aberdare Mts., *James*, s.n. ; Homo Point, *Napier* 5232.
   Tanganyika Territory : E. Kilimanjaro, *Haarer* 561 ; Arusha, *Haarer* B.160.
3. *Specimens associated with Johnston s.n.* (Follicles with filiform processes).
   Kenya Colony : Sultan Lamond, *Kassner* 643.
   Tanganyika Territory : Kilimanjaro, *Smith* s.n.
   British Somaliland : Sol, Origavo District, *McKinnon* S/164.

I believe these groups of specimens indicate the existence of hybrid swarms, the parentage of which may involve *Gomphocarpus integer*, *G. leucocarpus* and *G. fruticosus* together with others such as the little-known *G. rostratus*.

Gomphocarpus stenophyllus *Oliv.* in Trans. Linn. Soc. **29,** 110, t. 119 (1875), non Oliv. in Trans. Linn. Soc. Ser. 2, Bot. **2,** 342 (1887) ; K. Schum. in Engl. Naturl. Pflanzenfam. **4,** (2), 236 (1895) ; non *Ascelpias stenophylla* A. Gray (1876).

Asclepias leucocarpa Schltr. in Journ. Bot. **33,** 335 (1895) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 337 (1902).

Asclepias integra N. E. Br. apud Schltr. in Notizbl. Bot. Gart. Berlin, **9,** 25 (1924), saltem partim, non N. E. Br.

Oliver (1887) misidentified the *Johnston* specimen from Kilimanjaro which he referred to his *Gomphocarpus stenophyllus*. It was included in *Asclepias integra* by N. E. Brown (1895 ; 1902) and I have dealt with it and similar specimens in my remarks under *Gomphocarpus integer* (*supra*, p. 408).

The type of *Gomphocarpus stenophyllus* Oliv. is a *Speke and Grant* specimen from the Tabora district of Tanganyika ; other specimens at Kew, collected at a large number of localities in Kenya and Tanganyika southwards to the Ufipa Plateau, show that the plant is usually very floriferous, bearing rather long-peduncled multiflorous umbels ; the pedicels are noticeably slender compared with those of allied species such as *G. fruticosus*, and *G. integer*.

Gomphocarpus rostratus (*N. E. Br.*) *Bullock*, comb. nov.

Asclepias rostrata N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 331 (1902).

This species was recorded from the south-west of tropical Africa (*Baum* 500 from Angola, *Lugard* 22 and 231 from Ngamiland). The *Baum* collection was distributed from Berlin as " *Asclepias fruticosa* Linn." In my remarks under *G. integer* I have suggested that it may take part in the formation of hybrid swarms, but it may also itself be of hybrid origin.

The fruits are reminiscent of those of *G. integer*, but when ripe tend to be membranous in texture rather than woody ; the longitudinal lines noticed in the type specimen are fairly constant and when mature they are glabrous or nearly so, the tomentum of the early stages disappearing completely. The subaculeate papillae observed in the type are exceptional ; I have not seen any sign of them in mature follicles, and usually even in young ones the only tendency towards them is shown by a slight rugosity of the longitudinal lines. It is therefore arguable that the type specimen is to some extent a chimaera ; or, since I have already postulated the existence of hybrid populations, that it is of hybrid origin. It seems at the moment, however, better to include the mass of the available material with the type, to await the results of further field work on the whole group of species discussed above.

For the convenience of workers in other herbaria I append a list of the Kew specimens which I have referred to this species.

Kenya Colony : *Bally* 112 ; *Moreau* 56 ; *R. E. and T. C. E. Fries* 1036 (distributed as *A. integra* N. E. Br.) ; *Gardner* 143 ; *Dawson* 635 ; *Gilbert Rogers* 14 ; *Tweedie* 582 ; *MacDonald* 797 ; *Napier* 75 ; 399 ; 824 ; 2637 ; *Leakey* 3357 ; *van Someren* 1605 ; *Brodhurst Hill* 456 ; *Mettam* 136 ; *Battiscombe* 718.

Tanganyika Territory : *Burtt* 292 ; 1891 ; 3377 ; 5284 ; *Geilinger* 1683 ; 3348 ; 3473 ; *Savile* 30 ; *Greenway* 2434 ; *Haarer* 103B ; *Rounce* 246 ; *Michelmore* 745 ; *Hornby* 726.

Margaretta rosea *Oliv.* in Trans. Linn. Soc. **29,** 111, t. 76 (1875), et *l.c.* ser. 2, Bot. **2,** 342 (1887) ; Britten in Trans. Linn. Soc. Ser. 2, Bot. **4,** 29 (1894) ; K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 323 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 234 (1895) ; Schltr. in Journ. Bot. **33,** 305 (1895) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 373 (1902) ; Bullock in Kew Bull. **1933,** 79 (1933).

M. holstii K. Schum. in Engl. Bot. Jahrb. **17,** 133, t. 6G-J (1893), et in Engl. Pflanzenw. Ost Afr. **C,** 323 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 234, f.68G-H (1895) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 374 (1902) ; Eyles in Trans. Roy. Soc. S. Afr. **5,** 448 (1916).

M. cornutii Dewévre in Bull. Soc. Bot. Belg. **33** (2), 103 (1894), nomen, et *l.c.* **34** (2), 90 (1895), descr. ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 376 (1902), sub spp. imperf. conn., et *l.c.* 618 (1904) ; De Wild. Études Fl. Katanga, **1,** 108 (1903) ; Durand, Syll. Fl. Congol. 363 (1909).

M. orbicularis N. E. Br. in Kew Bull. **1895,** 256 (1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 375 (1902).

M. schyzei K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 323 (1895) et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 234 (1895) ; Schltr. in Journ. Bot. **33,** 305 (1895) ; S. Moore in Journ. Bot. **40,** 256 (1902) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 374 (1902) ; Eyles in Trans. Roy. Soc. S. Afr. **5,** 448 (1916) ; Weimarck in Botan. Notis. **1935,** 396 (1935) ; Suess. et Merxm. in Trans. Rhodesia Sc. Ass. **43,** 54 (1951).

M. passargei K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 234 (1895), nomen subnudum.

M. cornutii var. *pallida* De Wild. Études Fl. Katanga, **1,** 108 (1903) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 618 (1904) ; Durand, Syll. Fl. Congol. 363 (1909) ; De Wild. Notes Fl. Katanga, **3,** 21 (1914).

M. verdickii De Wild. in Ann. Mus. Congo, Sér. 5, **1,** 180 (1904) et Notes Fl. Katanga, **3,** 21 (1914) ; Durand, Syll. Fl. Congol. 363 (1909).

M. ledermannii Schltr. in Engl. Bot. Jahrb. **51,** 135 (1913).

M. ledermannii var. *foliosa* Schltr. *l.c.* 136.

M. decipiens Schltr. in Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1911–12, **1,** 265 (1916).

M. pulchella Schltr. *l.c.* 266, f. 32, t. 18, f.3.

M. inopinata Hutch. in Kew Bull. **1921,** 387 (1921) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 58 (1931).

Oliver (1875) described *Margaretta rosea* as the type of a new monotypic genus and the various forms described since then are here reduced to synonymy, with the exception of *M. distincta* N. E. Br.

Brown (1902) distinguished four species known to him and quoted a fifth as imperfectly known ; he omitted any reference to *M. passargei* K. Schum. which was mentioned by Schumann in 1895. Subsequently Schlechter described three more species ; De Wilderman also added one species and two varieties and Hutchinson (1921, 1931) described another.

The characters on which the various authors based their species and varieties related to colour, the form of the claw and limb of the petaloid

coronal lobes* and the presence or absence of a central (third) tooth arising from the mid-rib of the coronal lobe at or near the base of the limb. As a result of an examination of all the numerous specimens now preserved at Kew and at the British Museum I have concluded that none of these characters are correlated in a manner sufficient to warrant specific segregation, whilst geographical considerations indicate only that individuals in populations in one locality tend to resemble each other a little more than do individuals from different localities.

In Kenya, *H. M. Gardner* (No. 3513) noted " flowers vary in colour,—orange, pink and parti-coloured " ; *Mrs. J. Adamson* (No. 511) noted that " flowers vary from pale pink to intense yellow ochre " ; *Major E. J. Lugard* (No. 112a) noted " pink or orange or lemon ", whilst *Mrs. Brodhurst-Hill* (No. 99) and *Mrs. D. R. Tweedie* (Nos. 155, 156, 157, 158) give the colours orange, salmon pink, crimson, pinkish mauve, rose, dark rose, pale pink and apricot. In other areas the flower colours are not so well recorded by collectors, but comparison of the dried specimens with those from Kenya indicate a similar variation throughout the geographical range.

The shape and dentition of the petaloid limb of the coronal lobes is extremely variable. The type specimen was collected in Uganda (Unyoro) by *Speke and Grant* (No. 531) and I have not seen another specimen which exactly matches it. The limb of the coronal lobes is broadly elliptic or even orbicular in outline, but deeply and fairy regularly dentate with aboout five acute triangular teeth on each side. Most specimens from Uganda, Kenya and the Sudan tend to have less regular, smaller teeth and there is continuous variation in outline from sub-orbicular to ligulate. Reduction in the number of marginal teeth becomes a more or less fixed character towards the south and west. In Northern Cameroons and Northern Nigeria the teeth become either angular irregularities or mere undulations, whilst in Nyasaland the margin may become quite entire.

In all specimens the claw of the coronal lobes is complicate and its margins are produced at the top into two triangular teeth. Between these there may or may not be a third tooth—an outgrowth from the midrib of the lobe—which varies in size from a small upwardly directed hook to a comparatively large undulate or even toothed triangular lamina. The presence or absence of this third tooth was the basis of Brown's primary division of the genus and it is certainly possible to divide most of the specimens seen into two groups by making use of it. There remains a residuum, however, which are not easily so separated and these, together with the continuous size variation of the third tooth when it is quite definitely present, lead me to conclude that although its development may be gene-controlled and it may be a constant character in entire local populations, its absence does not indicate specific differentiation.

Geographically, both forms occur in Uganda, Kenya, Tanganyika and Nyasaland ; westwards through the Sudan to the Cameroons and N. Nigeria only the three-toothed form has been recorded, whilst westwards through Northern Rhodesia and in the Kantanga region of the Belgian Congo only the two-toothed form is known.

*I am indebted to Miss P. Halliday for a long series of scale drawings of dissections of material at Kew, which greatly facilitated this work —A. A. B.

On the basis of this geographical separation of the two forms in the western extensions of the range, it is clearly possible to postulate the former existence of two species which extended their ranges from the west, mingled and gave rise to hybrid swarms in East Africa, to produce the present population which is not divisible into sharply defined species. I prefer, however, to regard the whole population as a single species ; the various forms I regard as mutants which may finally result in specific differentiation. In order to indicate this view in the nomenclature, I propose to postulate two subspecies, the synonyms and distribution of which are indicated in tabular form below :—

	Synonymy*	N. Nigeria	N. Cameroons	Sudan	Uganda	Kenya	Tanganyika	Nyasaland	Mozambique	S. Rhodesia	N. Rhodesia	Katanga	Proposed Name
Third tooth present	**M. rosea**			+	+	+	+						**M. rosea** subsp. **rosea**
	M. whytei						+	+	+	+			
	M. inopinata	+											
	M. ledermannii		+										
	?*M. passargei*	+											
Third tooth absent	**M. holstii**				+	+	+				+		**M. rosea** subsp. **bidens**
	M. orbicularis						+	+					
	M. cornetii											+	
	M. verdickii											+	
	M. pulchella										+		
	M. decipiens											+	

*Heavy type in this column indicates the type of the new names.

Xysmalobium undulatum *(Linn.) Ait. f.* Hort. Kew. ed. 2, **2,** 79 (1811) ; E. Mey. Comm. Pl. Afr. Austr. 215 (1837) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 572 (1907), incl. syn., non Decne. ; lectotypus nominis generici.

Asclepias undulata Linn. Sp. Pl. 214 (1753).

Xysmalobium ensifolium Burch. ex Scott-Elliott in Journ. Bot. **28,** 364 (1890) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 571 (1907).

X. angolense Scott-Elliott in Journ. Bot. **28,** 365 (1890) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 232 (1895) ; Hiern in Cat. Afr. Pl. Welw. **1,** 682 (1898) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 308 (1902).

X. prismatostigma K. Schum. in Engl. Bot. Jahrb. **17,** 120 (1893), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 232 (1895).

X. dispar N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 307 (1902).

X. barbigerum N. E. Br. *l.c.*.

Asclepias leucotricha Schltr. in Warb. Kunene-Samb. Exped. Baum, 342 (1903).

Xysmalobium leucotrichum (Schltr.) N. E. Br. in Thiselton Dyer. Fl. Trop. Afr. **4** (1), 615 (1904).

The genus *Xysmalobium* was described by Robert Brown (in Mem. Wern. Soc. **1,** 38 : 1811) and to it he assigned the two species *Asclepias undulata* Linn. and *A. grandiflora* Linn. f. He did not, however, make the necessary new combinations in accordance with the Rules and the specific name of this species, which is clearly the type of the generic name, must be attributed to Aiton as indicated above.

The new synonymy involves an extension of the known range of *X. undulatum* from the Cape, Natal and the Transvaal through Nyasaland and the Rhodesias to Angola and northwards in eastern Africa through Tanganyika to the northern slopes of Kilimanjaro and Mount Kenya.

It may be objected that *X. barbigerum* should be maintained as a distinct species on account of its much smaller flowers and the relation between the corona and staminal column—the characters used by Brown in his key ; the plant, however, is known from only one gathering (*Baum* 322) and it seems more probable that the flowers are immature. Throughout the range, there is great variation in leaf-size, but the elongated, narrowly triangular shape is always maintained, together with the more or less deeply cordate base. There is also great variation in the amount of indumentum on leaves and stem ; this is, however, always of the same kind. On such characters the various " species " have been founded ; in the writer's view they can only be regarded as variations within a great geographical and ecological range.

The fruit of this (and many other) species has been but rarely collected in Tropical Africa ; it consists of solitary or paired inflated follicles, more or less ellipsoidal in shape and about twice the size of a hen's egg ; they are clothed with curled, filiform, pubescent processes. Such fruits are in sharp contrast with those of many other species which have been referred to the genus and are much more akin to those of some species of *Gomphocarpus*, *Pachycarpus* and *Woodia*.

Glossostelma spathulatum (*K. Schum.*) *Bullock*, comb. nov. ; lectotypus nominis generici.

Schizoglossum spathulatum K. Schum. in Engl. Bot. Jahrb. **17,** 120 (1893), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 233, 234, f.68 A-D (1895), et in Bull. Soc. Bot. Belg. **37,** 122 (1898) ; Durand et Schinz, Études Fl. Congo, **1,** 192 (1896) ; Durand, Syll. Fl. Congol. 358 (1909).

Gomphocarpus spathulatus (K. Schum.) Schltr. in Journ. Bot. **33,** 269 (1895).

Xysmalobium bellum N. E. Br. in Kew Bull. **1895,** 311 (March 1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 311 (1902) ; K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 425 (1895) ; Norman in Journ. Bot. **67,** Suppl. 95 (1929).

Glossostelma angolense Schltr. in Journ. Bot. **33,** 322, t. 352B (Nov. 1895) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. Nachtr. (1) zum **2–4,** 287 (1897) ; Hiern in Cat. Afr. Pl. Welw. **1,** 688 (1898) ; non *Xysmalobium angolense* Scott Elliott in Journ. Bot. **28,** 365 (1890).

Xysmalobium cecilae N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1) 310 (1902) ; Norman in Journ. Bot. **67,** Suppl. 95 (1929) ; Weimarck in Botan. Notis. **1935,** No. 22, 374 (1935).

Xysmalobium grande N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 311 (1902).

Xysmalobium spathulatum (K. Schum.) N. E. Br. *l.c.* 312.

Xysmalobium speciosum S. Moore in Journ. Bot. **47,** 216 (1909).

In the *Flora of Tropical Africa,* the late Dr. N. E. Brown (1902–4) distinguished four species of *Xysmalobium* here reduced to one, on characters involving only the length and thickness of the coronal lobes. These I consider to be inadequate, at least when observed only from dried herbarium material. Also, it seems likely that the corona-lobes are subject to at least as much variation in size relative to other parts of the flower as is the calyx in relation to the corolla ; if this latter character only were taken into account it would be possible to multiply the number of " species " still further.

The material in the Kew Herbarium includes specimens from the Belgian Congo (Tonkooji, *Kässner* 2339), southern Tanganyika, Nyasaland, Portuguese East Africa, Northern Rhodesia, Southern Rhodesia and Angola.

Glossostelma carsoni (*N. E. Br.*) *Bullock,* comb. nov.

Xysmalobium carsoni N. E. Br. in Kew Bull. **1895,** 250 (Oct. 1895).

Asclepias mashonensis Schltr. in Journ. Bot. **33,** 356 (Dec. 1895).

Schizoglossum lividiflorum K. Schum. in Engl. Bot. Jahrb. **28,** 454 (1900) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 367 (1902).

Gomphocarpus chlorojodina K. Schum. in Engl. Bot. Jahrb. **30,** 383 (1901).

Schizoglossum carsoni (N. E Br.) N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 366 (1902) ; Weimarck in Botan. Notis. **1935,** No. 22, 393 (1935).

S. chlorojodinum (K. Schum.) N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 366 (1902).

Asclepias nemorensis S. Moore in Journ. Bot. **47,** 218 (1909).

Schizoglossum kassneri S. Moore in Journ. Bot. **50,** 362 (1912).

Asclepias extenta S. Moore, *l.c.* 343.

A. carsoni (N. E. Br.) Schltr. in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Congo-Exped. 1911–12, **1,** 267 (1916).

Xysmalobium mildbraedii Schltr. in Engl. Bot. Jahrb. **51,** 134 (1913).

The known geographical range of this species is almost co-extensive with that of its congener *G. spathulatum* (p. 414); there are specimens in the Kew Herbarium from northwestern and north-eastern Northern Rhodesia (*Milne-Redhead* 3383, 3795, 3795A ; *Bullock* 2107, 2141), Southern Rhodesia, Nyasaland, Portuguese East Africa, the Katanga area of the Belgian Congo and from southern Tanganyika Territory. It is at once distinguished from *G. spathulatum* by its very long linear leaves and smaller flowers which are, however, of the same form. I have not seen *Schizoglossum lividiflorum* K. Schum. but the description, together with the aptness of the specific epithet and the late Dr. Brown's note " Is it distinct from *S. carsoni* N. E. Br.?" leave me in little doubt that it is correctly included here. Similarly, I have not seen *Xysmalobium mildbraedii* Schltr. but I can find nothing in the description to separate it from *G. carsoni*, whilst *Schizoglossum kassneri* is merely a green-flowered form.

Glossostelma lisianthoides (*Decne.*) *Bullock*, comb. nov.

Gomphocarpus lisianthoides Decne. in Ann. Sc. Nat. Sér. 2, **9,** 325 (1838) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 237 (1895), et in Engl. Bot. Jahrb. **30,** 382 (1901).

Gomphocarpus chironioides Decne. in DC. Prodr. **8,** 562 (1844).

Xysmalobium dissolutum K. Schum. in Engl. Bot. Jahrb. **17,** 119 (1893), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 232 (1895) ; Durand et Schinz, Études Fl. Congo, **1,** 192 (1896) ; Durand, Syll. Fl. Congol. 358 (1909).

Schizoglossum violaceum K. Schum. in Engl. Bot. Jahrb. **17,** 122 (1893), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 233 (1895).

Xysmalobium fritillarioides Rendle in Journ. Bot. **32,** 162 (1894) ; Hiern in Cat. Afr. Pl. Welw. **1,** 682 (1898).

Chlorostelma fritillarioides Welw. ex Rendle in Journ. Bot. **32,** 162 (1894), nomen nudum.

Asclepias dissoluta (K. Schum.) Schltr. Westafr. Kautschuk-Exped. 309 (1900) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 347 (1902).

A. lisianthoides (Decne.) N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 327 (1902).

?*Stathmostelma chironioides* K. Schum. ex De Wild. et Dur. in Bull. Herb. Boiss. Sér. 2, **1,** 829 (1901), nomen ; Dur. and Syll. Fl. Congol. 361 (1909), nomen.

K. Schumann (1901) recorded this species from Tanganyika, but I have seen no specimens from that area ; it appears likely that the record may represent a misidentification of *G. carsoni* (*supra*) which does occur in southern Tanganyika.

All other published records of *G. lisianthoides* are from Angola and the southern Belgian Congo and it is therefore of interest to note the following:

Northern Rhodesia. Mwinilunga District, 4500–5000 ft. ; " greenish-yellow flower backed with brown, shiny raised red centre " ; Oct. (fl.), *Marks* 48. Mwinilunga District, just E. of Dobeka Bridge in *Brachystegia* woodland on sand ; " erect perennial with tuberous roots,

corolla lobes yellowish-green, suffused purple-brown outside, column whitish, corona lobes whitish at sides, glossy red at back, very dark towards beak, anthers yellowish-green " ; 5 Nov. 1937 (fl.), *Milne-Redhead* 3110.

Glossostelma xysmalobioides (*S. Moore*) *Bullock*, comb. nov.

Asclepias xysmalobioides S. Moore in Journ. Bot. **50,** 342 (1912).

This species is known to me only from the type in the British Museum, a single specimen collected by *Gossweiler* (No. 4009) near Fort Princess Amelia in the Kubango district of Angola, in December, 1906. The collector notes that it is rare and it occurs in " open short thickets ".

Stenostelma capense *Schltr.* in Engl. Bot. Jahrb. **18,** Beibl. No. 45, 6 June 1894 , et *l.c.* **20,** Beibl. No. 51, 41 (1895), et in Bull. Herb. Boiss. **7,** 40 (1899) ; typus nominis generici.

Schizoglossum aciculare N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 363 (1902), et in Thiselton Dyer, Fl. Cap. **4** (1), 620 (1907).

Gomphocarpus stenoglossus Schltr. in Journ. Bot. **32,** 257 (Sept. 1894).

Krebsia stenoglossa (Schltr.) Schltr. in Journ. Bot. **32,** 450 (1896) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 588 (1907).

I am unable to separate the two species united above ; it is noteworthy that Schlechter and Brown maintained both of them in different genera. The plant is known from widely separated localities from South-West Africa, the Orange Free State, the Transvaal, Swaziland and Ngamiland.

Stenostelma corniculatum (*E. Mey.*) *Bullock*, comb. nov.

Lagarinthus corniculatus E. Mey. Comm. Pl. Afr. Austr. 208 (1837).

Gomphocarpus corniculatus (E. Mey.) Dietr. Syn. Pl. **2**, 901 (1840) ; Decne. in DC. Prodr. **8**, 561 (1844).

Krebsia corniculata (E. Mey.) Schltr. in Engl. Bot. Jahrb. **20,** Beibl. No. 51, 41, (1895), et *l.c.* **21,** Beibl. No. 54, 3 (1896), et in Journ. Bot. **32,** 450 (1896) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 587 (1907).

This species, together with the preceding, constituted the *Krebsia* Harv. (non Eckl. et Zeyh.) of the *Flora Capensis*. It is known from Table Mountain in the south to Natal and the Transvaal in the north.

The generic name *Krebsia* Harv. (1868) is a later homonym, being antedated by *Krebsia* Eckl. et Zeyh. (1836), and must be rejected. *Lagarinthus* E. Mey. has been split up and all its species assigned elsewhere, but *L. corniculatus* E. Mey. cannot be selected as the type of the generic name since E. Meyer himself included it in a group of six species which he regarded as " *species . . . . dubiae . . .* ". I have therefore resuscitated Schlechter's name *Stenostelma*.

Aspidoglossum biflorum *E. Mey.* Comm. Pl. Afr. Austr. 201 (1837) ; lectotypus nominis generici.

Schizoglossum biflorum (E. Mey.) Schltr. in Engl. Bot. Jahrb. **20,** Beibl. No. 51, 25 (1895), in adnot. ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 641 (1907), incl. var. *concinnum* (Schltr.) N. E. Br., var. *integrum* N. E.

Br. et var. *gwelense* N. E. Br. ; Weimarck in Botan. Notis. **1935,** No. 22, 386 (1935).

S. excisum Schltr. in Journ. Bot. **32,** 259 (1894), et *l.c.* **34,** 420 (1906) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 638 (1909).

S. venustum var. *concinnum* Schltr. in Engl. Bot. Jahrb. **20,** Beibl. No. 51, 25 (1895).

S. shirense N. E. Br. in Kew Bull. **1895,** 253 (1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 361 (1902).

S. gwelense N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 360 (1902).

S. conrathii Schltr. in Engl. Bot. Jahrb. **38,** 27 (1906) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 637 (1907).

This species exhibits the same kind of colour variation as *A. connatum* (*infra* p. 419) ; on this character varieties were founded and are here included within the normal range of the species.

E. Meyer included three species in his genus *Aspidoglossum* and though this one was listed as number three, it seems to be the best one to select as the generic type. *A. heterophyllum* is probably generically distinct and scarcely agrees with the generic description, whilst *A. fasciculare* (*Schizoglossum ciliatum* Schltr. of *Fl. Cap.*) seems, according to N. E. Brown (1909) to have been confused by both Meyer and Drege. In any case it is much less well known than *A. biflorum.*

The distinctions given by Brown (1909) to separate his *Schizoglossum conrathii* and *S. excisum* (which he regarded as very near to each other) from *S. biflorum* (which he admitted to be very variable) are not of diagnostic value ; this applies also to his (1902) distinctions between *S. shirense* and *S. gwelense.* It is noteworthy that in 1909 Brown himself reduced *S. gwelense* to varietal rank under *S. biflorum.*

Geographically *Aspidoglossum biflorum* extends from the eastern Cape Province through the Transvaal to Southern Rhodesia and Portuguese East Africa.

Aspidoglossum angustissimum (*K. Schum.*) *Bullock*, comb. nov.

Schizoglossum angustissimum K. Schum. in Engl. Bot. Jahrb. **17,** 123 (1893) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 357 (1902), incl. syn.

S. leucotrichum Schltr. nomen in herb. Kew., non *Asclepias leucotricha* Schltr.

The description of the pubescence of the corolla-lobes of this species given by N. E. Brown (1902) was evidently taken from the young, unopened flowers of one or both of the Schweinfurth specimens which he cited. It is evident on examination of other specimens that the " minute . . . . . papilla-like hairs . . . . . ", on the inner face grow out into the long white, stout, woolly hairs characteristic of more mature specimens.

At Kew, *A. angustissimum* is represented by specimens from Southern Rhodesia, Nyasaland, Tanganyika, Uganda, Anglo-Egyptian Sudan French Sudan and Cameroons.

Aspidoglossum whytei (*N. E. Br.*) *Bullock*, comb. nov.

Schizoglossum whytei N. E. Br. in Thiselton Dyer, Fl. Trop, Afr. **4** (1), 357 (1902).

It is remarkable that this plant, twice collected by Whyte in Nyasaland in 1896, has never been found again. The features by which N. E. Brown separated it from *A. angustissimum* (K. Schum.) Bullock (p. 418) particularly the more robust habit and much larger flowers serve at once to distinguish it from all other tropical species of the genus. Of the two specimens cited by Brown, *Whyte* 353 must be selected as the type of the specific name.

Aspidoglossum connatum (*N. E. Br.*) *Bullock*, comb. nov.

Schizoglossum connatum N. E. Br. in Kew Bull. **1895,** 69 (1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 356 (1902) ; K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 425 (1895), et in Engl. Bot. Jahrb. **28,** 455 (1900) ; Schltr. in Notizbl. Bot. Gart. Berlin, **9,** 28 (1924).

This peculiar species is at once distinguished from its congeners by its corolla lobes, which are connate at their tips as in *Ceropegia* and some other genera. The *locus classicus* is Fwambo in Northern Rhodesia (*Carson* 17 ; the only other record given in the *Flora of Tropical Africa* is *Goetze* 644 from Uhehe in Tanganyika. In the Kew herbarium there are now several gatherings from Uganda, and one (*Napier* 2915) from the Kavirondo district of Kenya. The last is of some interest in that the flowers are said to be maroon, whereas most other collectors give green, yellow or cream as the colour. *Chandler* (No. 1569) gives the note " flowers flushed faint purple ". I also include here a plant collected by *Sillitoe* (No. 448) at the Lei River, Lado District in the Sudan, who described the flowers as " chocolate brown ". The writer collected this plant in the swampy grassland near Lake Chila, Abercorn (No. 2210), some forty miles to the west of Carson's locality, and also (No. 1961) some hundred miles to the north on the Ufipa Plateau. The Abercorn specimen, I noted to have " cream petals and purple or cream corona ", the Ufipa plant " yellow flowers ". This variation would indicate that the extreme colour variations noted above are not unlikely in this species.

A further character in which considerable variation is found is in the indumentum of the corolla lobes. These may be glabrous or with at most a few scattered hairs on the outer surface, to hirsute and also quite densely puberulous.

The plant is always found in swampy grassland, where it may be overlooked although quite abundant and further collections will no doubt considerably extend its known range and give a more complete picture of its variability.

Aspidoglossum interruptum (*E. Mey.*) *Bullock*, comb. nov.

Lagarinthus interruptus E. Mey. Comm. Pl. Afr. Austr. 208 (1837).

L. abyssinicus Hochst. in Pl. Schimp. sect. tertia, No. 1633, nomen nudum, ex Benth. et Hook. f. Gen. Pl. **2,** 753 (1876) in adnot. sub *Schizoglossum* E. Mey., nomen nudum.

Schizoglossum interruptum (E. Mey.) Schltr. in Engl. Bot. Jahrb. **18,** Beibl. No. 45, 4 (1894), in adnot. ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 660 (1907).

S. abyssinicum K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2),

233 (Oct. 1895) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 356 (1902).

S. altissimum Schltr. in Engl. Bot. Jahrb. **20,** Beibl. No. 51, 13 (Jun. 1895) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 660 (1907).

S. masaicum N. E. Br. in Kew Bull. **1895,** 252 (Oct. 1895), et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 358 (1902).

S. lasiopetalum Schltr. in Engl. Bot. Jahrb. **38,** 29 (1905).

S. eylesii S. Moore in Journ. Bot. **52,** 149 (1914).

Bentham (1876) was the first to suggest that *Lagarinthus abyssinicus* and *L. interruptus* might be conspecific, but they have been maintained as distinct species on account of the long horn-like coronal appendage of the former compared with the apiculus or tubercle of the latter. In the material included in the above synonymy, however, there is ample variation between these two extremes to indicate that the length of the appendage is not a reliable diagnostic feature. The possibility of hybrids may be suggested, but the uniformity of other characters throughout the range of the species as here understood does not support such an explanation.

The extended known range of the species is now from eastern South Africa through the Rhodesias to Tanganyika, Kenya and Uganda, northwards to Abyssinia and westwards through the Sudan to northern Nigeria.

The specimens examined show considerable variation in general facies, but this can be accounted for by the effects of different ages at the time of drying, method of drying and the vigour of the individual specimens. The last is shown particularly by the number of flowers in each inflorescence, which varies from a few to a dozen or more ; the amount of pubescence, which is always greatest in the region of the inflorescences also varies from quite thin to relatively dense, on stem, bracts, pedicels, calyx and corolla.

Lagarinthus tenuis *E. Mey.* Comm. Pl. Afr. Austr. 203 (1837), lectotypus nominis generici.

Asclepias filiformis Linn. f. Supp. Pl. 169 (1781), non N. E. Br. (1902), nec *Lagarinthus filiformis* E. Mey. (1837).

Schizoglossum linifolium Schltr. in Engl Bot. Jahrb. **18,** Beibl. No. 45, 4 (1894) ; N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 617 (1907).

Lagarinthus was described by E. Meyer (Comm. Pl. Afr. Austr. 202 : 1837) to accommodate nineteen species of South African plants, divided into three groups—*Orthopodes* (spp. 1–6) with smooth, fusiform follicles borne on erect, straight pedicels, *Campylopodes* (spp. 7–13) with echinate fruits borne on pedicels with a circular kink, and *Species . . . . dubiae* (spp. 14–19), of which the fruit was unknown.

Various phrases in Meyer's description, particularly his references to the fruit, indicate that the generic type should be selected from his *Orthopodes* ; these species are characterised by smooth as against echinate follicles, borne on straight as against kinked peduncles.

Meyer states that the first two species are " inter *Gomphocarpi* et *Lagarinthi* genera ambigunt " and are thus ineligible for consideration. *L.*

navicularis E. Mey. (*l.c.* 204) is also ineligible, since Meyer did not see its follicles. *L. brevicuspis* E. Mey. (*l.c.*) should not be selected as the generic type since Meyer was not sure of its taxonomic status.

Of the remainder *L. tenuis* E. Mey. (*l.c.* 203) is the *Schizoglossum linifolium* Schltr. of the *Flora* Capensis and *L. gibbus* E. Mey. (*l.c.* 204) is the *Asclepias gibba* (E. Mey.) Schltr. of the same work, which I propose to refer to Schlechter's genus *Stenostelma*.

It is convenient, therefore, to make Meyer's *Lagarinthus tenuis* the lectotype of his generic name. Accepting the synonymy of the *Flora Capensis* the correct name for the species is as shown above.

Lagarinthus galpinii (*Schltr.*) *Bullock*, comb. nov.

Schizoglossum galpinii Schltr. in Engl. Bot. Jahrb. **18,** Beibl. No. 45, 15 (1894), et in Journ. Bot. **34,** 420 (1896); N. E. Br. in Thiselton Dyer, Fl. Cap. **4,** 1, 616 (1907).

Galpin collected this species near Barberton; the type (No. 1326) at the summit of Saddleback mountain and on a hill side near Rimers Creek (No. 861). Additional material, collected for Mr. G. Thorncroft in Lomati Valley, also near Barberton, is mounted on three sheets in the Kew herbarium with "*Herbarium Burtt-Davyanum*" labels, one of which bears the number 2090.

Lagarinthus diversus (*N. E. Br.*) *Bullock*, comb. nov.

Schizoglossum diversum N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 617 (1907).

It is clear from Brown's description that he made great use of the specimen collected by *Miss Pegler* (No. 661), though his sketches of his dessection of the flower are attached to the *Bowker* (no. 6) specimen which he also cited. I have no doubt that these two specimens are conspecific and since there is a portion of the *Pegler* specimen in the National Herbarium, Pretoria, I propose its selection as the lectotype of the species. The *Bolus* (No. 8701) specimen cited by Brown is not, apparently, at Kew.

Lagarinthus atrorubens (*Schltr.*) *Bullock*, comb. nov.

Schizoglossum atrorubens Schltr. in Journ. Bot. **32,** 353 (1894), et *l.c.* **34,** 420 (1896); N. E. Br. in Thiselton Dyer, Fl. Cap. **4** (1), 615 (1907).

This species is known only from the type collection, *Baur* 767, from the Basajaberg (Bazeia Mountain, Tembuland). The leaves recall *Lagarinthus galpinii*, but the plant is more stiffly erect and the very deeply coloured flowers render it quite distinct.

Kanahia laniflora (*Forssk.*) *R. Br.* in Salt, Voy. Abyss. App. lxiv. (1814) (*Kannahia*); Spreng. Syst. Veg. **1,** 851 (1825); G. Don, Gen. Syst. **4,** 149 (1837); Decne. in Ann. Sc. Nat. Sér. 2, **9,** 330 (1838); N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 296 (1902), Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Part 2, 66 (1949).

Asclepias laniflora Forssk. Fl. Aegypt. Arab. 51 (1775); Vahl, Symb. Bot. **1,** 23, t. 7 (1790); Del. Cent. Pl. Voy. Méroé, 49, t.3, f.3 (1826).

Kanahia delilei Kotschy ex Decne. in Ann. Sc. Nat. Sér. 2, **9,** 330 (1838), et in DC. Prodr. **8,** 537 (1844) ; A. Rich. Tent. Fl. Abyss. **2,** 34 (1851).

K. forsskalii Decne. in DC. Prodr. **8,** 537 (1844).

K. kannah Roem. et Schultes, Syst. Veg. **6,** 94 (1820).

Gomphocarpus glaberrimus Oliv. in Trans. Linn. Soc. **29,** 110, t.120 (1875).

Asclepias glaberrima (Oliv.) Schltr. in Journ. Bot. **33,** 335 (1895).

Kanahia glaberrima (Oliv.) N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 297 (1902) ; Dyer in Fl. Pl. S. Afr. t. 900 (1943) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Part 2, 66 (1949).

K. consimilis N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 298 (1902) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 55 (1931).

Asclepias coarctata S. Moore in Journ. Bot. **46,** 297 (1908).

The name changes introduced by Decaisne (1838, 1844) were explained by N. E. Brown (1902) as being due to misidentification ; it was rather due to the description of a second species which is not in fact distinct, although many authors (see Brown, 1902) have used the second name (*K. delilei*, particularly for the plant of tropical Africa.

Although *Kanahia* was described by R. Brown (Mem. Wern. Soc. **1,** 39 : 1809), and he referred *Asclepias laniflora* Forssk. to it, he did not then make the necessary new combination, which should be attributed to him as indicated above.

I am unable to maintain the additional species included in the *Flora of Tropical Africa* by N. E. Brown, nor his criticisms of the identifications of authors, based on the belief that more than one species was involved. The differential characters given by him are, I find, not more than expressions of the age of the flowers examined on the one hand, or of the state of preservation on the other ; they are not in any way correlated with the geographical distribution. The identity of *Asclepias coarctata* with *Kanahia glaberrima* was noted as long ago as 1925 by Mr. P. J. Greenway (*adnot. in herb. Kew.*) but this was never, apparently, published. The genus remains monotypic.

There is at Kew much more material than was seen by Brown in the early years of this century and the known distribution is from Arabia and Egypt southwards through Abyssinia and the eastern territories of the horn of Africa to Kenya and Uganda, westwards through the Sudan to the Cameroons, Nigeria and the Ivory Coast, southwards through Tanganyika to Portuguese East Africa and the Transvaal, and hence westwards through Southern Rhodesia to Angola and South West Africa.

Throughout this great range, collectors are agreed that it is a plant of sandy or rocky river beds—a special habitat which has no doubt considerably aided its linear distribution.

Fockea multiflora *K. Schum.* in Engl. Bot. Jahrb. **17,** 145 (1893), et in Engl. Pflanzenw. Ost Afr. **C,** 326 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 294, f.90 P-U, 296 (1895) ; Hiern in Cat. Afr. Pl. Welw. **1,** 693 (1898) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 428 (1903) ; Durand, Syll. Fl. Congol. 366 (1909) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Part 2, 65 (1949).

F. schinzii N. E. Br. in Kew Bull. **1895,** 259 (1895), et in Fl. Trop. Afr. **4** (1), 428 (1903) ; Brenan, *l.c.*

The thick stems of this liane, attaining a foot or more in diameter, form a tangled mass on the woodland floor and somewhat thinner branches rise to the tops of the trees, twining and scrambling in all directions. The flowers are borne precociously in pedunculate corymbs at the nodes of the thinnest branches, and are brown in colour. The stems contain a very copious milky latex.

The plant is not so common as one might expect and the writer came across it only once, in the mteshi bush of Nkonte Island, Mweru Wa Ntipa, Northern Rhodesia (No. 1186), where it was associated with the candelabrum *Euphorbia*, species of *Combretum* and *Terminalia*, and *Capparidaceae*. The raised ground known as Nkonte Island is often shown on maps as a blue patch of water ; it is in fact a low rocky hill surrounded by seasonal swamp grassland dominated by *Hyparrhenia* spp., *Echinochloa pyramidalis* and their associates, such as *Aeschynomene* spp., *Sesbania* spp. and numerous *Cyperaceae*.

Marsdenia abyssinica *(Hochst.) Schltr.* in Engl. Bot. Jahrb. **51,** 143 (1913) ; Norman in Journ. Bot. **67,** Suppl. 97 (1929) ; Robyns, Fl. Sperm. Parc Nat. Albert, **2,** 107 (1947) ; Brenan, Forest Trees and Shrubs . . . . Tanganyika Terr. Part 2, 66 (1949).

Pterygocarpus abyssinicus Hochst. in Flora, **26,** 78 (1843).

Marsdenia spissa S. Moore in Journ. Bot. **39,** 260 (1901) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 420 (1903).

The fruit of the typical form of this species is provided with several crisped, more or less chartaceous, longitudinal wing-like processes, whilst the tip of each follicle tends to be produced into a more or less wingless beak. This combination of fruit characters is fairly constant in specimens from Abyssinia, Kenya and Uganda ; there are no fruiting specimens at Kew from the Cameroons or from Northern Nigeria where the species also occurs. These fruits are in very striking contrast to the straight-winged follicles of *M. rubicunda* N. E. Br. and the smooth follicles of *M. schimperi* Decne. and other species.

Specimens from Tanganyika and Southern Rhodesia (listed below) show even greater complication of the wings than typical *M. abyssinica* and the naked or semi-naked beak is absent. I have been unable to detect any satisfactory floral differences from the type but the fruit difference warrants the description of a named form ; I am not satisfied as to its status :—

Marsdenia abyssinica *(Hochst. Schltr.* f. **complicata** *f. nov.*, a typo alis folliculorum angustioribus valde complicatioribus ut videtur duplo- vel triplo-cristato-crispatis haud simpliciter crispatis, folliculis apice haud acuminato-rostratis neque nudis differt.

Tanganyika Territory. Tubugwe, Mpwapwa District, 3700 ft., a liane over trees in riverine fringing forest, 9 Oct. 1935 (fr.), *Hornby* 699. Moyowosi River valley, 53 miles S. of Mbugwe, 3800 ft., a climber to 40 ft. over trees of ancient termitaria in *Combretum* woodland, 31 July 1950 (fr.), *Bullock* 3050. Kate, Ufipa District, 5000 ft. 21 Oct. 1949, (fl.

fr.) *Leonard Silungwe* 24 [Comm. *Bullock*, s.n.] (type). (Leonard gives the Chimambwe vernacular as Chilembelembe).

Southern Rhodesia. Zimbabwe Ruins, May, 1920 (fr.), *Walters* 2798. Other material from Tanganyika, Southern Rhodesia and Angola shows flowers only and cannot, therefore, be definitely referred here.

Ceropegia abyssinica *Decne.* in DC. Prodr. **8,** 644 (1844) ; Engl. Hochgebirgsfl. Trop. Afr. 343 (1892) ; K. Schum. in Engl. Bot. Jahrb. **17,** 150 (1893) in obs. sub. *C. loranthiflora* K. Schum. ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 462 (1903) ; Werderm. in Engl. Bot. Jahrb. **70,** 206, t.8, f.17 (1939) ; non A. Rich. Tent. Fl. Abyss. **2,** 46 (1851), nec Vatke in Linnaea, **40,** 217 (1876).

C. steudneri Vatke in Linnaea, **40,** 217 (1876) ; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 272 (1895), ubi errore *C. steudneriana* ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 463 (1903).

C. leucotaenia K. Schum. in Engl. Bot. Jahrb. **17,** 151 (1893), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 272, f.81B (1895) ; Hiern in Cat. Afr. Pl. Welw. **1,** 695 (1898) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 451 (1903) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 227 (1938) et in Engl. Bot. Jahrb. **70,** 217 (1939) in obs. sub *C. hispidipes* S. Moore ; S. Moore ex Norman in Journ. Bot. **67,** Suppl. 99 (1929).

C. gilletii De Wild. et Durand in Bull. Soc. Bot. Belg. **38,** 95 (1899) ; Durand, Syll. Fl. Congol. 367 (1909).

C. hispidipes S. Moore in Journ. Bot. **46,** 309 (1908) ; Werderm. in Engl. Bot. Jahrb. **70,** 217, t.11, f.35 (1939).

C. bequaerti De Wild. in Rev. Zool. Bot. Afr. **8,** fasc. I. Suppl. Bot. 1 (1920) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 231 (1938) ; Robyns. Fl. Sperm. Parc Nat. Albert, **2,** 102 (1947).

C. achteni De Wild. Pl. Bequaert. **4,** 356 (1928) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 231 (1938).

C. filicalyx Bullock in Kew Bull. **1933,** 145 (1933) ; Werderm. in Engl. Bot. Jahrb. **70,** 206, t.8, f.16 (1939).

There is now in the Kew Herbarium a long series of specimens collected in Angola, Northern and Southern Rhodesia, Tanganyika, Kenya and Abyssinia which have been referred to one or other of the above "species". I have not seen specimens from the Belgian Congo, but have no hesitation, after examination of a photograph of the type and analysis of De Wildeman's description in accepting Werdermann's (1938) reduction of *C. gilletii*, to which I also add *C. bequaerti* and *C. achteni*. Re-examination of the material available in the Kew Herbarium leads to the other conclusions summarised in the new synonymy listed above. Werdermann (1939) united *C. steudneri* and *C. abyssinica* and was doubtful as to the status of *C. filicalyx* and *C. hispidipes*, whilst he recognised also the close affinity of *C. leucotaenia*. The last was, with *C. hispidipes*, separated from the others by the twining habit, but this species is not an obligate twiner. It flowers before the onset of the main rainy season and when it grows in unburnt grassland, it tends to twine laxly around grass-culms ; when no such support is available, it remains erect. The separation of *C. filicalyx* from *C. abyssinica* was based, it is now seen, on more robust growth which produced all the differential characters observed when the original

description was drawn up. The more recent material examined shows complete gradation between the two forms ; some specimens show even greater variation. The slight variations in corona structure shown in Werdermann's (1939) figures are in my opinion attributable to differences in age and condition of the flowers dissected.

Vatke (1876), accepting Richard's (1851) misidentification of *C. abyssinica*, re-described that species as *C. steudneri* ; the mistake was rectified by K. Schumann (1893) who described the *C. abyssinica* of Richard as *C. loranthifolia*. Acting under the " Rules " then in force, Schumann then abandoned the name *C. abyssinica* Decne., for which he substituted *C. steudneri* Vatke in the " Pflanzenfamilien " (1895). N. E. Brown (1903) apparently failed to realise this, and maintained both " species " which he separated on a small difference in flower size easily attributable to either age or method of drying.

Ceropegia schlechteriana *Werderm.* in Engl. Bot. Jahrb. **70,** 196 (1939).

Northern Rhodesia. Katuka, Abercorn District, 5000 ft., in fire-protected Brachystegia woodland, in shady rocky gully ; " a twining herb, flowers cream with dark green throat " ; 12 March 1950 (fl.), *Bullock* 2622.

This is one of the few African species of *Ceropegia* in which the corolla lobes are widely spreading, neither coherent at the tips, nor twisted together. It was previously known only from the Uluguru and Kyimbila Districts of Tanganyika Territory.

Ceropegia stenantha *K. Schum.* in Engl. Bot. Jahrb. **17,** 152 (1893) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 459 (1903), incl. var. *parvifolia* ; Werderm. in Engl. Bot. Jahrb. **70,** 223 (1939).

Riocreuxia longiflora K. Schum. in Engl. Bot. Jahrb. **28,** 459 (1901), non *Ceropegia longiflora* Poir. (1811).

Ceropegia infausta N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 459 (1903).

C. angustiloba De Wild. in Ann. Mus. Congo, Sér. 4, fasc. 3 (Études Fl. Katanga, **1**), 109 (1903) ; N. E. Br. in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 621 (1904) ; Durand, Syll. Fl. Congol. 366 (1909) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 229 (1938).

C. mazoensis S. Moore in Journ. Bot. **46,** 309 (1908).

C. quarrei De Wild. in Contrib. Fl. Katanga, Suppl. 1, 71 (1927) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 229 (1938).

The late Dr. N. E. Brown regarded the character of separation, in age, of the tips of the corolla lobes as " unique in the genus ". It was noted by De Wildeman in his description of *C. angustiloba* and was recorded in the field by the writer. Brown regarded such a character as so remarkable that he suggested that it may be an artefact of drying ; this is certainly not so and though I have no observational data, I regard it as a post-pollination development.

The characters by which the plants represented by the new synonyms listed above were separated from *C. stenantha* are shown by the more adequate material now available to be valueless. In particular, mere

flower size cannot be regarded as diagnostic unless flowers of similar age are compared ; the corona characters, though certainly specific, must be observed in mature flowers but before post-pollination disintegration begins. Further, it must be borne in mind that dried herbarium material can never give thoroughly reliable data in regard to either size or form of the corona and there must be some allowance made for observed apparent differences.

C. stenantha is the only species which I observed in southern Tanganyika (Ufipa District) as being " fairly frequent ". Most central African species of *Ceropegia* are perhaps not so particularly rare or infrequent as difficult to see. They tend to have thin, simple stems, twining around the stiff culms of tall grasses and so are overlooked. *C. stenantha*, however, produces very numerous stems from a thickened perennial basal portion which twine around themselves and any other available vegetation, producing a luxurious growth comparable with that of many convolvulaceous plants.

The Kew Herbarium now includes collections of *C. stenantha* from the Anglo-Egyptian Sudan (the *locus classicus* is Seriba, Jur Ghattas), Uganda, Tanganyika, Northern Rhodesia, Southern Rhodesia and the Katanga area of the Belgian Congo. Further exploration will almost certainly result in considerable extension of this range.

Ceropegia papillata *N. E. Br.* in Kew Bull. **1898,** 308 (1898) et in Thiselton Dyer, Fl. Trop. Afr. **4** (1), 452 (1903) ; Werderm. in Engl. Bot. Jahrb. **70,** 219 (1939).

This plant was described by N. E. Brown from the Zomba plateau in Nyasaland and Werdermann recorded it also from the Kyimbila district of Tanganyika Territory. Two further records may now be added :—

Tanganyika Territory. Mbeya district, southern slopes below Mporoto, 6200 ft., near stream in tall grass, very rare ; 12 March 1932 (fl.), *St. Clair-Thompson* 693. Ufipa District, Malonje escarpment, 6500 ft., climbing on tall grasses in semi-shade of shrubs and trees ; " a twiner to about 4 ft., corolla-tube yellowish, limb black " ; 16 March 1951 (fl., fr.), *Bullock* 3785.

METHODS OF THE EXPERIMENTAL GROUND IN RELATION TO TAXONOMY.

W. B. Turrill.

Introduction. Experimental methods in plant taxonomy are supplementary to herbarium and other methods. They cannot, and so far as one can judge never will, replace them. Nevertheless, they are of increasing importance and have some obvious advantages over other methods with which they can be easily, and always should be, combined. These advantages can be briefly summarized as follows :

1. Living material is studied.
2. Continuous examination of all phases of the life-history is possible.
3. Large numbers of individuals of the same and of different populations can be scored and compared.
4. Ecotypes can be distinguished from ecads.
5. The range of fluctuations (environmental modifications) can be determined.
6. Limiting factors to the growth of the individual and to reproductive capacity (in the broadest sense) can be determined.
7. Abundant material is available for the extension of research, often by team-work, into anatomy, physiology, genetics, cytology, etc.

The principal limitations of experimental methods, apart from the general ones of space, labour, and time, are :

1. The necessity of scoring at definite periods, e.g. just when the plants are in flower. This necessitates very careful planning to avoid over-accumulation of work.
2. The possibility of making actual comparisons with current material only.
3. The impossibility of re-checking or extending scoring.

These limitations can be largely, but not entirely, avoided by a judicious use of herbarium methods applied to experimental materials.

The writer wishes it to be clearly understood that this essay on experimental methods is based entirely on his own experiences and that these, for this kind of research, are, apart from initial field collecting of material, limited to the southern half of England. Some considerable modifications may be necessary for workers under other conditions, for example, in the tropics.

General Methods.

There are a number of general methods and basic principles that apply to all or most experimental research in plant taxonomy. These are enumerated and discussed immediately to avoid repetition under subsequent headings but it must be remembered that, usually, though where necessary with some variations, they apply to every piece of research and are of fundamental importance.

A. *Planning.* Experimental research in taxonomy is laborious, space-occupying, and time-consuming. It is also of long-range nature. For

these reasons planning well ahead is essential to full success. It is, of course, impossible to foretell with certainty the results of new experiments, to avoid all mistakes, or to anticipate all " acts of God ". Nor must accuracy be subordinated to any other considerations. Nevertheless, labour, space, and time must be saved as far as possible, and subject only to the over-riding insistence on scientific validity of results. The following are items of advice :

a. Do not start with too ambitious a scheme. You will not live long enough to experiment with more than a few species and the next generation will, if your work be well done, have more advanced ideas and better methods.

b. If possible, choose with careful consideration the taxa (species or any other taxonomic groupings) on which to experiment. Sometimes the species may be more or less set by other work or by pre-existing conditions. One may be already studying a group taxonomically by herbarium or other methods and decide that such and such treatment of material in the experimental ground is essential to a solution of certain problems. Again, a worker's accepted specialization may limit choice. An agrostologist would presumably consider it beneath his dignity to work on any other group than grasses. Apart from such limitations, and having full regard to matters dealt with in the next paragraph, consideration should be given to the following matters : that the species is likely to grow well with normal life-history under the climatic and edaphic conditions of the experimental ground to be used ; that individuals will not occupy too much space or rapidly grow into one another or spread vegetatively : that there will not be too much clashing of maximum scoring periods. Perennial herbs have, with some exceptions, considerable advantages over woody plants on the one hand and annuals on the other. If a number of species be chosen it is best to have such as will not need maximum scoring at the same season. For example, six species all with their flowering peak in July will mean undue concentration of work compared with that involved by having a different species with a flowering mode in every month from April to September.

c. Have as clear an idea as possible of the purposes of the experiments before starting. The purposes may be limited, for example, to determine whether a given character be " stable " or not, or wide, perhaps an attempt " to look at a species from inside " by learning all one can about it through its behaviour in the experimental ground, or comparison of a pair of species contrasting ecologically, or even comparison of the behaviours of all the species in a genus. If the general aim be still wider, say to determine the validity of certain concepts of a theory of evolution, it is well to allow a long pause and to clarify thought by visualizing as nearly as possible all likely results of an experiment or series of experiments.

d. Before commencing experimental research on a chosen taxon, search published literature and herbaria for all relevant information and make abstracts and file references. One may find the work has already been adequately done. Almost certainly much will be learnt regarding some details of structure and behaviour that will aid the research.

B. *Collection of material.* Ideally the experimenter should collect his own material from the wild. He will then be able to note the natural con-

ditions of growth and make a fair analysis of the wild population (or a sample thereof) from which experimental material is taken. The ecological conditions must be recorded. For experimental research in taxonomy it is advisable to avoid unlocalized material and especially that from gardens ; the chances are often high that it is " contaminated ". Exact records of locality, habitat, and date of collecting must be kept and every individual given a stock number under which all data must be filed. Original living material may be more or less adult plants or seeds. With perennial herbs there are advantages in using both. Woody plants may have to be struck from cuttings or propagated by grafting or budding.

In experiments with living plants there are two sets of variables : the plants and their surroundings. For some experiments, as in transplanting tests, it is often essential to use a large number of " individuals " of the same kind. An " individual " is defined for this purpose as a physiologically separate plant or part of a plant and may thus be a ramet of a clone. It is often important to know that any set of individuals is genetically uniform. This explains the advantage of many herbaceous perennials, since they can be readily multiplied by vegetative propagation —by division of clumps, by cuttings, by separation of runners, etc. In this way a " clone " of any required number of " ramets " can be easily and quickly obtained. This is no denial of the advantages of also having information concerning the genetical consitution of the stock being used, but the complete genetical uniformity of a batch of seedling plants has usually to be doubted.

C. *Labelling.* It is of the utmost importance that sufficient, clear, and accurate labels should be used. Too much care cannot be taken in this matter and it is better to be over generous than mean in the use of labels. The ideal garden label has not yet been invented but a golden rule is to inspect all labels once a month and to renew (the writing if not the actual label) where there is any marked sign of deterioration. The entry number of a stock-plant is the most important information to be put on a label (or the family and individual number if offspring be concerned) but sometimes other concise information is useful as it may save reference to the record book or serve as a check in comparative scoring. If assistants (gardeners or others) be employed the supreme importance of maintaining precise labelling must be impressed upon them—under threat of instant dismissal or worse.

D. *Attention.* It is assumed that the experimenter has sufficient knowledge of ordinary horticultural practices and these are not, therefore, considered here. Gardeners have sometimes to be restrained and firmly informed that plants in an experimental ground are being grown for this or that experimental purpose and not for competition in the local flower-show or for decorations at harvest festivals. Apart from " transplant " and similar experiments, a rule should be to allow plants to grow as naturally as possible. Thus, there should be no application of organic manures or artificial fertilizers if this can be avoided. If the soil becomes impoverished and additions of food are essential they must be in known recorded quantity, strictly controlled, applied regularly, and in very medium amounts. The greatest general artificial modification to which plants are subjected in the experimental ground is the absence of com-

petition with other plants of the communities in which they grow in nature. This is unavoidable, with a few exceptions, but must be kept in mind.

A word of warning must be given regarding " rogues ". Seeds or other disseminules often introduce into the experimental beds plants other than those under experiment. When stock of any kind is being raised from seed and when seedlings are being pricked out prior to final planting, thoroughly sterilized soil should be used. Beds should not be cropped with the same species season after season. There should be a planned rotation or intervening fallowing. No specimens should be allowed to go to seed, or uncontrolled dispersal of seed should be avoided, unless this is necessary for purposes of the experiments. One other safeguard is to plant out in straight rows with a known number of individuals in a row so that any " extras " are at once suspect. Otherwise one can only control rogues by constant examination of the plots and complete ruthless elimination of alien plants. With certain perennial herbs a particular danger is the establishment of seedlings of rogues in the centre of a legitimate plant. Occasionally it may be necessary to sacrifice the plant with the rogue.

E. *Scoring.* This has to be done at definite times. Dates must always be recorded on the actual scoring sheets and must be fairly comparative. For example, basal leaves in overwintering rosettes should be scored in, say, mid-December for *all* plants and families involved in the comparison, not in October for some and in March for others.

" Scoring " means making and recording judgement of qualitative and measuring of quantitative characters. Standards are essential. Measurements should be in the metric system and fixed chosen standards must be adhered to very strictly for characters scored qualitatively. Colours must be matched with standards and Ridgway, " Color Standards ", is the best work the writer knows for this purpose. Colour matching, by the way, is often best done with many flowers in early evening or on a slightly dull day. The agreed judgement of two or three persons (preferably ♀ and ♂) is reasonably safe. For other qualitative characters the worker may have to make his own standards. They must, however, be clearly defined (by words, diagrams, drawings, photographs, etc.) and rigidly adhered to. For intermediates between classes or standards the word " intermediate " itself can be used for halfway expression and the convention followed of greater emphasis on the second word when double terms are used. For example, ovate-lanceolate means more lanceolate than ovate while lanceolate-ovate means more ovate than lanceolate. The first word is used to modify the meaning of the principal descriptive term. In Latin it would be folia ovato-lanceolata or folia lanceolato-ovata.

A loose-leaved system of scoring-sheets has much to recommend it. These should be prepared in advance and, if large numbers are to be used, can be printed or otherwise multiplied. A sample scoring sheet used for researches on *Silene* (see Kew Bull. 1928 to present time) is printed here. In the experimental ground a wad of scoring sheets fixed to a stiff cardboard of the same size by a metal clip at the top and another

at the bottom is most convenient for actual scoring. Every scoring sheet must be dated and made identifiable by the number of the population, family, cross and/or other particulars.

K.
Plant No.
Length stem
No. of Nodes
Length middle internode
Length longest internode
Antho. in veg. parts
Indumentum
Leaf length
Leaf breadth
No. of flowers
Antho. in calyx
Calyx shape
Petal length
Petal breadth
Petal colour
Lobing of petals
Depth of lobing
Corona
Antho. blotch
Petals overlap
Segs. overlap
Antho. in anthers
Antho. in fils.
Sex
Stig. colour
Immature seed colour
Fruit shape
Mature seeds

The characters scored depend upon the aims of the research and there can be no general rules. It is better to over-score than to under-score both as regards numbers of characters and degree of precision. This is

because classes can later be added together but cannot be separated beyond the limits of the data as scored. Students should remember the importance of root systems and of fruits and seeds.

It must be emphasized that all " negative " results should be scored. That seeds did *not* germinate, that plants did *not* flower, that a cross did *not* take, and so on, may in due course be found to be facts of importance.

F. *Harvesting.* Many characters have to be, or are best, scored in the growing state *in situ* in the experimental ground. Some have to be scored in a laboratory, and common-sense care must be taken in collecting specimens for this. Sometimes when urgent scoring is very great in amount, seasonal time may be saved by using herbarium methods to preserve specimens for later (usually winter) scoring of certain characters. For some detailed comparisons this may be essential. Permanent specimens of important stock plants should always be made and a selection of specimens from experimental families is also very often valuable. Dry fruits and seeds can be collected and stored in pill boxes or in envelopes.

Ecological experiments as applied to taxonomy.

Plants, for taxonomic purposes, have to be classified on the basis of their own intrinsic characters and should not be diagnosed by their ecological or geographical ranges. This is a necessary abstraction which does not imply that the inter-relations of plant and habitat are of no interest to the taxonomist. On the contrary, to understand the reactions of environment on the developing organism is fundamental in deciding status at and below the special level. Moreover, ecological and geographical classifications are often parallel with a classification made on morphological characters. When there is a breakdown of correlation in this respect special care and re-checking are essential.

a. *Simple comparative cultures under approximately uniform conditions.*

It is essential for the taxonomist to know whether character differences indicate different genotypes or only different phenotypic expressions of one genotype. In other words, whether or not he is dealing with two (or more) inherently different kinds of plants or with individuals that are genetically alike but have been modified in the course of development by reaction with different environments. Growing plants under one set of conditions as nearly the same as possible may show that they belong to different genotypes when the initial differences are retained, but is not conclusive evidence that they belong to the same genotype if the differences are not maintained, since the differences may only be expressed under conditions other than those of the one environment chosen.

It must be remembered that soil and other conditions are not uniform in all parts of an experimental ground and, in addition, many kinds of " accidents " happen to individuals. Slugs, insects, and other invertebrates may attack one individual and not another. Even birds, cats, and human visitors may be selective modifiers. Hence it is necessary to grow sufficient numbers of individuals and sometimes even to adopt a randomly dispersed planting. It is difficult to advise as to numbers but consideration should be given to using 10, 25, or 100 individuals and, where results have to be compared, to using the same number throughout any

one experiment, or one set of experiments. This is not fundamental so long as samples are large enough but saves time in comparing results of scorings.

However many plants of every kind or collection be grown it is essential that every individual be fully scored for every character being considered. Measurements and counts are particularly valuable since they can give precise and concise values that can be later treated statistically. Characters that are difficult to express precisely should, however, not be ignored but should be standardized after preliminary attempts at their classification. This very often applies, for example, to habit which it may be better to analyze into a number of characters than to treat as a unit.

In all experiments involving a plant's surroundings these must be described with the necessary degree of precision. Established standards and measurements as used by meteorologists, pedologists, and ecologists are most satisfactory but may require modification for any given set of experiments. The scoring of biotic factors is more difficult and it is advantageous to keep them negative or very simply positive. In other words, let the plants grow without competition with other plants (of the same or of different kinds), keep away animals, avoid using diseased material, and so on, or else study the effects of a biotic factor varied as simply as possible.

b. *Transplant experiments under different conditions.*

Fully to test by experiment whether or not two phenotypes belong to different genotypes, they must be grown under all environmental conditions. This is impossible and in any set of experiments a reasonable selection of environments has to be made. There is almost endless scope for ingenuity in choosing or making environments. Consider the orthodox classification into climatic, edaphic, and biotic factors. Radically to change climate and to give complete control may involve great expense, such as the construction of heated glass-houses, installation of special lighting, the use of electric fans, and so on. It is, however, possible to control light and shade, wind exposure, frost action, and water supply, within limits, by cheap and simple devices. If two or more experimental grounds with different climates be available, as at different altitudes or near to and distant from the sea, every opportunity should be taken to study the effects of climate on many genotypes. This may mean well coordinated team work.

Edaphic factors are more amenable to experimental investigation than are climatic ones. It is neither too difficult nor too expensive to import or make up sufficient quantities of different soils for a series of experiments likely to yield interesting results. If pots or other containers be used they must be large enough to allow proper development of the root systems and other treatments must be uniform or under control—watering and shading, for example. Soil analyses must be made and scoring must be full and along the lines already indicated.

The experimental study of biotic factors with a taxonomic end in view is an enormous and widely open field. The aim should be to simplify any factor, though this is usually more easily said than done. Thus cutting with a pair of scissors can simulate the grazing of an animal without

treading or manuring effects, which latter can in their turn and independently be otherwise simulated. Competition between plant species should be studied first by using only two species, then three, and so on.

The term " ecotype " has tended to become one of the " blessed " words in ecological taxonomy or taxonomic ecology. There certainly are in many species ecologico-genetical entities that have not always been recognized in floras and other taxonomic treatments. They can only be proved to be such by experimental methods similar to those outlined above or by more elaborate cytogenetical research. It is sometimes said that micro-units like ecotypes are not the concern of the taxonomist. If, however, as in modern taxonomy, our aim is to understand the structure, behaviour, and development of species, and not merely to describe and name them, every variant has some importance.

c. *Correlation and presentation of results of ecological experiments as applied to taxonomy.*

Experimental methods, it is again emphasized, cannot replace herbarium and other methods in taxonomy but can supplement them. Hence the results must be correlated with those obtained by the latter. Often this means refinement of classification as regards paramorphs or considerable improvements in descriptions. Taxonomy must be conservative in the sense that a new classification involving new nomenclature must not be made for every new fangled hypothesis put forward for testing. Classification is essential from the beginning of any research. Most often one starts with a classification provided already in some monograph or flora and probably based on gross morphology only. This has been termed alpha classification. Research of the kind contemplated in this essay inevitably helps classification to be improved from an alpha towards an ideal omega classification that will have assimilated all that can be known about the plants being classified. It has, however, to be remembered that published taxonomy is a *sine qua non* of research in ecology, genetics, cytology, and every other branch of " pure and applied " botany. Changes in concept and nomenclature especially, should not, therefore, be made until they are well tested and found to be essential to taxonomic progress.

In the seed-bearing plants it is doubtful if there be many different genotypes that are not phenotypically distinguishable, at least when subjected to such experiments as those considered above. Genetically fixed physiological races that are not morphologically different one from another are probably rare in the wild, though in some few groups the differences are slight and in others further investigations are greatly needed. There are exceptions to these generalizations but for practical reasons attempts must be made, and they are usually successful, to base the presentation of results on morphological characters in the first place. It is then possible to correlate such results both with physiological characters and with those of previously proposed taxonomic schemes, however much modification of these becomes necessary. A golden rule is not to establish a new name or change an old one unless there are at least ten good reasons for so doing !

The results of ecological experiments must, of course, be presented first on their own merits. Space forbids any more than general suggestions here. There should be a judicious use of statistics, tabulations, diagrams,

drawings, and photographs. Accounts for publication should be not only precise but also concise and readable. Masses of data should be well sifted and finally presented in comparative form and as far as possible as summations. Original scoring sheets, full extensive tabulations, and working details are not for publication but should be filed in some recognized permanent institution and the fact recorded in the published work. Many papers can be considerably reduced before publication, with very great advantage and no disadvantage, by this device.

Genetical experiments as applied to taxonomy.

The geneticist naturally chooses his material and plans his experiments most often with the aim of advancing the study of pure genetics. He is relatively indifferent to the source of his stock plants, to their behaviour in the wild, or their relation to taxonomic problems. His material must be genetically suitable or he discards it. Genetical experiments so limited yield data valuable to the taxonomist but often more by elucidating genetical principles than by aiding in the solution of concrete taxonomic problems. It is true that cultivated and wild plants are both living organisms and there is no doubt that the mechanisms of inheritance are the same in both, but the emphasis on different factors of evolution is different. Origin from the wild of some cultivated plants is unknown or uncertain, as it is for wheat, maize, and *Primula sinensis*, to name only three. Many plants have been in cultivation for centuries, for an unknown number of generations. During this time they have been subjected to peculiarities of selection absent in the wild and have not been open to the complicated selection of interacting factors of the wild environment. Man has preserved much that nature would have exterminated and has made many combinations that were naturally impossible. Selection and hybridization occur in the wild and under cultivation but the directions and limitations are sufficiently different to give widely different results. It is also possible that mutation rate and even the kind of mutations produced may be influenced by some conditions of cultivation as compared with conditions in the wild. Most taxonomists are primarily concerned with or are most interested in wild floras. They are, therefore, especially desirous of obtaining any information genetical research can give concerning plants of known wild origin. There are difficulties to be overcome in doing this. It is easy to obtain financial backing for genetical studies of crop plants but not for studies of species of no economic value. Techniques of cultivation are known for field and garden cultispecies; they have to be worked out from scratch for most wild species. The same is true for many details of life-histories. Assuming that the difficulties can be overcome the following special considerations are relevant.

With a free choice of species, pick out such as show on preliminary investigation a reasonable amount of variation and can be studied on a large scale in the wild near to the experimental ground. Select about twenty stock plants from every one of about six species and transplant these to the ground. They can be entered in the record book and labelled A1, A2, A3, ... ; B1, B2, B3, etc., the letter indicating the species and the figure the individual plant. After a year's study and experimentation probably three species will be considered more suitable

than the other three and the latter can be discarded. The last selection will depend on such determined facts as ease of cultivation, suitability for controlled crossing and selfing, production of viable seeds, and seasonal spacing of maximum scoring and harvesting times.

Species having been finally selected and the first stock plants established these must be scored and specimens preserved. They should then be selfed, under control, if the species be hermaphrodite or monoecious and self-fertile. Otherwise stock plants should be crossed in pairs, the members of some pairs being as similar and others as diverse as possible. Selfings are advisable as the first experiments, for several reasons but particularly because they give data from which the amount of intra-specific crossing that occurs in the wild can be determined and because they enable relatively pure lines to be picked out or, by further successive selfing, made. Plants homozygous, for at least the characters being scored, are extremely useful in long-range researches.

For later seasons, series of crosses, selfings, and back-crosses must be planned and the need for carrying on to F_2, F_3, or later generations considered. There is a tendency for experiments to increase in a geometrical ratio and this has to be curtailed from time to time. In all experiments the results of which are to be compared with one another, it is desirable that all seed to be sown should be of the same age and all plants scored should be of equal age. Thus, a useful simple rule with many herbaceous perennials is : all seeds harvested in the autumn of year 1 are sown in the spring of year 2 during which seedlings are scored, and the resulting mature plants scored in the summer of year 3.

No attempt can be made here to give instructions in odinary genetical procedure. These can be obtained from appropriate text-books of genetics. Beyond these is the necessity to compare results at frequent intervals with published taxonomic accounts and with the results of analyses of wild populations. In the course of studying wild populations individual plants will probably be discovered that it is advisable to transplant as additional stock plants for future use. The need for keeping experiments within bounds has, however, always to be remembered. Extension of researches by examination of and selection from populations near at home to others more distant will depend largely on the duration of the experiments. The advice is repeated that genetics begins best at home and extends abroad later, so far as its value to taxonomy is concerned.

Correlation and presentation of results.

Our aim is not genetical research isolated as such but genetical research applied to taxonomic problems as a contribution to the new systematics or move towards an omega classification. Genetical experiments of the kind suggested should give, *inter alia*, information concerning the genetic control of taxonomic characters, dominance or its absence, the gene composition of wild populations, the flow of genes, the kind and frequency of mutations, sterility barriers, and a surprisingly varied collection of valuable data on such matters as germination, growth rate, pollination, death rate, and the like.

Purely genetical results must be set out in ratios and by other well-established methods of presentation described in genetical works. Em-

phasis should, however, eventually be given to comparison of results from one population to another, from stocks from one habitat to another, and from stocks from one geographical area to another. This means that essentially the same characters should be scored to the same standards throughout the researches, and the results so tabulated and summarized that comparisons can be constantly and easily made. This is true also for analysis of wild populations made in connection with the breeding researches. The ultimate aim is to bring together, to synthesize, the results obtained by all methods applied to the same, or samples of the same, populations.

Concluding remarks. Experimental taxonomy must be treated as long-range research. It is time-consuming and needs care and attention, with a high degree of technical skill and ingenuity. In compensation, it is of absorbing interest, involves a due proportion of healthy out-of-doors work among living organisms, and offers a vast field for discoveries. It introduces students to a dynamic aspect of taxonomy that is most likely to be new to them since it finds no place in present-day text-books, though it will from now onwards in any that are of good class.

THE AUTHOR OF INOCYBE GEOPHYLLA VAR. LATERITIA.

R. W. G. Dennis.

In British Basidiomycetae, 1922, Rea recorded four colour varieties of the very common *Inocybe geophylla* (Sow. ex Fr.) Quel. viz : the typical white form, var. *lilacina* Fr., also common, var. *fulva* Pat., seldom recorded but well defined and recognised by modern monographers and " var. *lateritia* (Weinm.) Stev." The last named was unknown to him and characterised merely by the statement " Differs from the type in the brick-red p." Lange is the only modern author who claims to have seen this variety though several compilers have copied the citation printed by Rea. Thus Heim in his monograph of *Inocybe* (1931) evidently did not know the fungus but listed the name in his index, attributing the epithet to Weinman, Hymeno et Gasteromycetes in Imperio Rossico observatos recensuit, Petropoli, 1836.

Reference to this work shows, however, that though several colour forms of *Agaricus geophyllus* Sow. were described on pp. 192–3 they were not allotted formal varietal names. Thus we have the following :—

" b. pileo lilacino - - - - -

c. pileo fuscescente - - - - -

d. pileo dilute-lateritio. Pileus carnoso-membranaceus, conico-campanulatus, sericeus, dein fere planus, obtusus ½–1′ lat. Lamellae adnexae, ventricosae, confertae, obscure argillaceae 1–2″ lat. Stipes 2′ long. 1″ crass., albus, farctus, apice albo-pulverulentus.

e. stipite glabro

β candidus Batsch.

Variety d, of which the description is quoted above, is presumably that referred to in Rea's citation but this can scarcely be considered the place of publication of a varietal epithet " *lateritius* .. In his Enumeratio

stirpium in Agro petropolitano sponte crescentium p. 194, published the following year Weinmann summarised the varieties of *A. geophyllus* more briefly as (a) pileo albo. (b) pileo lilacino. (c) pileo fuscescente. β Stipite decumbente. Variety *lateritius* is thus not to be found here either.

Hence it is not surprising that in compiling volume 5 of the Sylloge fungorum Saccardo mentioned the existence of a variety coloured " lateritio ", citing Weinmann as his authority, but printed as formally described varieties only var. *fulva* Pat and var. *violacea* Pat. In this treatment of Weinmann's observations he followed that of Fries in Hymenomycetes Europaei p. 235, 1874 and that of the Epicrisis 1838.

In trying to trace the place of publication of this varietal name one is led to a brief note by Berkeley and Broome, Notices of British Fungi 1234*, 1871 : " *A.* (Inocybe) *geophyllus* var. *lateritius*. This curious form, if it is really the same species, has been sent to us by Mr. Jerdon from Jedburgh. When dry it retains its brick-red colour." It will be noted that there is here no reference to Weinmann or to any previous author, though every other fungus name printed in the same paper is either duly ascribed to an earlier author or formally marked " n.s." Hence it is impossible to say whether Berkeley and Broome had Weinmann's variety " pileo dilute lateritio " in mind or not, though they must have known of the reference to it in Fries Epicrisis. Probably they did not regard themselves as formally proposing a new variety but in 1879 Stevenson, compiling Mycologia Scotica, published the same collection and one of his own, and definitely ascribed the epithet to Berkeley and Broome thus :—

" var. *lateritius* B. & Br. No. 1234

Retaining its brick-red colour when dry.

Jedburgh A. Jerdon. Glamis J.S."

In Hymenomycetes Britannici 1886 he amplified the description slightly : " The variety *lateritius* is a remarkable one. It is not altogether red but stained persistently, retaining the colour when dry. Jedburgh etc." W. G. Smith, perhaps regarding Stevenson's description as the first adequate to validate the name, ascribed it to him : " *Inocybe geophylla* Quel. - - - - var. *lateritia* W. G. Sm. *Agaricus geophyllus* Sowerb. var. *lateritius* Stev. P. red varying yellow or white, sometimes white-scaly." The only other published British collection assigned to the variety in question seems to be one by Bucknall, Leigh Woods, Bristol, July 1879 but there is a watercolour by R. Baker, labelled Clevedon, July 1890, filed as var. *lateritius* among Cooke's collection of drawings at Kew. No microscopic data are available for either Bucknall's or Baker's collections but Jerdon's fungus is still well preserved in Berkeley's herbarium at Kew.

It appears that the varietal epithet *lateritius* came into use casually, almost by accident but it seems scarcely possible to ascribe it to Weinmann. Unless some continental author can be found to have formally proposed it prior to 1871 it appears to the writer that the name should be credited to Berkeley and Broome and typified by Jerdon's collection from Jedburgh. The species of *Inocybe* are highly critical but he ventures a suggestion that the latter is *I. pudica* Kühner and that *I. geophylla* var. *lateritia* (Berk. et Br.) W. G. Smith may be relegated to synonymy under that species.

OBITUARY

We are sorry to record the death of the Hon. Mrs. Evelyn Moloney, better known to workers on East African botany as Miss E. R. Napier.

Miss Napier was the second daughter of the late Lord Napier of Magdala and Lady Napier and she has been a resident of Kenya for about 30 years.

As Botanist at the Coryndon Museum, Nairobi, she was instrumental in building up, between the wars, the Museum's collections of the native plants of Kenya. She enlisted an energetic band of helpers whose duplicate specimens, together with her own, have greatly enriched the Kew collections. Miss Napier was responsible for forming a very close link between the Botany Department of the Coryndon Museum and the Royal Botanic Gardens, Kew, a link which has been ably maintained by her successor, Mr. P. R. O. Bally.

Many of the plants collected by Miss Napier have proved to be new to science, and have become the types of specific names, whilst many more in the Kew Herbarium await description in the course of preparation of the " Flora of Tropical East Africa ". Her name has been perpetuated in *Dicliptera napierae* E. A. Bruce, an attractive member of the *Acanthaceae* which is still represented at Kew only by Miss Napier's two gatherings.

E. Milne-Redhead.

A new Textbook of Plant Physiology*.—This excellent account of plant physiology has everything to recommend it to students—except the price to those who have to pay in sterling. It is well-written, up-to-date in its information, clearly printed on good paper, and illustrated by many diagrams. The sequence of subjects in twenty chapters is nutrition, metabolism, and growth and reproduction. The specially valuable features of the book are the constant reference from laboratory experiments to the results of field observations. There is thus forged a link between plant physiology and plant ecology. Another striking and interesting feature is the space devoted to the recent or relatively recent advances in knowledge of subjects that were unknown or ignored till a decade or two ago. This is particularly true of the chapters concerned with growth and development. The discovery of definite growth promoting or growth controlling substances is revolutionizing research on these subjects. Biochemistry is becoming the most important branch of plant physiology. There is less evidence that biophysics is advancing at anything like the same rate.

W. B. Turrill.

*J. Bonner and A. W. Galston : Principles of Plant Physiology, W. H. Freeman and Co., San Francisco, 1952, $5.50 (£2.7.-.) pp. 509, 219 illustrations.

Flower Gardening in the 19th Century.—The history of horticulture is a long one and British gardens have played no unworthy part in the progress of what is both an art and a science. Yet one wonders if " progress " be the right word. Certainly there have been many new plants introduced into cultivation or created by the selectionist or hybridizer. On the scientific side there has been great advance in and extension of knowledge, in spite of the sneers of high placed horticulturists who too frequently betray their own prejudices and ignorance. On the aesthetic side it would appear that there have been more " swings of the pendulum " and changes in fashion than progressive advances. That, at least, is the impression one gains from reading the recently published account* of Victorian gardening.

Mr. Taylor's book is interesting from both the horticultural and historical points of view. The gardener will learn much regarding the past, but not too far distant past, fluctuations in his profession or hobby. In particular, he will appreciate the influence of a few outstanding characters, whether male or female, on the development of the craft of gardening. One has the suspicion that sufficient justice has not been done, either in this book or in other accounts of the history of horticulture, to the "middle class gardeners", meaning those who are neither commercial specialists not big noises in the gardening world. Perhaps they retained more individuality and originality than is generally suggested. However, it is good to read of the peculiarities of giants and would-be giant-killers. In these days of stress much of Victorian history sounds not unlike a fairy tale.

Mr. Taylor does not always make his meaning clear. What is the " Darwinian darkness " that has " descended upon classification " (p. 52) ?, Why should ignorance regarding clones and chromosomes make for stability (p. 116) ? Some of his statements are certainly incorrect. George Nicholson did not follow Sir Joseph Hooker as Director of the Royal Botanic Gardens, Kew (p. 182). He never was Director but was Curator from 1886 to 1901. A fern cannot develop from a seed, even an invisible one (p. 67).

W. B. TURRILL.

*The Victorian Flower Garden by Geoffrey Taylor, pp. 212, 19th June 1952, Messrs. Skeffington & Son, 12/6d.

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